RAILROAD GAZETTE

FRIDAY, JANUARY 24, 1902.

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Contributions

The Value of Lake Nicaragua.

Des Moines, Jan. 6, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE.

In estimating the cost of canals would it not be well to consider how much Lake Nicaragua is worth to the United States in consideration of its being fresh water instead of salt? We notice that they are digging a canal at Seattle to avail themselves of a body of fresh water to get rid of barnacles, to make accessible fresh water which is about 20 ft. higher than the Sound.

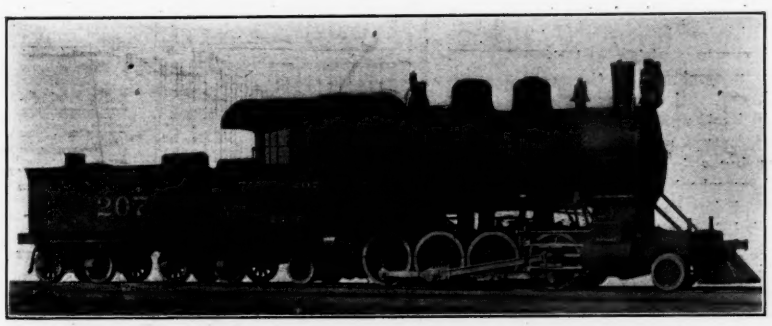
D. H. A.

Consolidation Locomotive with Trailing Wheels.

Dunkirk, N. Y., Jan. 13, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE.

We notice in your description of the lignite burning consolidation locomotive for the Bismarck, Washburn & Great Falls Railway, page 18 of your issue of the 10th inst., this statement: "This locomotive is the first of its kind in the United States as to wheel arrangement."



Brooks Consolidation Locomotive—Mexican Central.

Cylinders, diam.	21 in.	Wheel base, rigid.	13 ft.
Cylinders, stroke.	26 in.	Wheel base, driving.	13 ft.
Driving wheels, diam.	49 in.	Wheel base, engine.	28 ft.
Boiler, diam.	78 in.	Weight in working order:	
Fire-box, length.	120 in.	Rear truck.	24,800 lbs.
Fire-box, width.	37¾ in.	Drivers.	145,200 lbs.
Flues, number.	412	Front truck.	23,450 lbs.
Flues, diam.	2 in.	Total.	193,450 lbs.
Flues, length.	12 ft. 1 11/16 in.		

We are sending you under separate cover two small photographs, as follows:

Chicago & Calumet Terminal locomotive No. 101, built by the Brooks Locomotive Works in March, 1893. [Not shown.]

Mexican Central locomotive No. 207, built by the Brooks Locomotive Works in September, 1897; gage 4 ft. 8½ in.; fuel, bituminous coal or wood; boiler pressure, 180 lbs. per sq. in.

We beg also to say that we at present have under contract locomotives of the same type for one of our customers. We thought in view of the above statement that you would wish to be set right on the subject.

R. J. GROSS, *Second Vice-President.*

Announcements have been made in all Oriental cities that, commencing in May, passengers will be carried from any point on the Asiatic coast to London or Paris for £52, food and all accommodations included. In that month the International Sleeping Car & European Express Trains Co. will begin a semi-weekly service each way, with trains de luxe between Paris and Peking. Passengers will be carried the entire distance in luxurious cars of the International Co., for the sum stated. At first there will be two breaks in the journey, one at Lake Baikal, and the other at New Chwang. At New Chwang the difference of gage between the trans-Siberian line and the Imperial Chinese Railway will necessitate a change of cars. For the convenience of passengers to and from central and south China and Japan, Dalny and Port Arthur will be served by sections of the same trains. The Chinese Eastern R. R. (Manchurian) will put on a fast line of connecting steamers between Dalny and Shanghai, enabling Shanghai passengers to reach London in three weeks. The low rate named is made with the object of stimulating travel over the trans-Siberian line. The International Palace Hotels Co., controlled by the same company, has begun building hotels at Peking and New Chwang.

The Testimony Concerning the Tunnel Collision.

The rear collision of passenger trains which occurred in the Fourth Avenue Tunnel, New York City, Jan. 8, was investigated by Coroner Scholer, of New York County, on Jan. 16, 17, 20 and 21. From the large mass of testimony reported in the daily papers we condense the most important parts. We give the testimony as it was recorded by the reporters; but the reader should bear in mind that this inquest is an ex parte hearing, the witnesses having no counsel to advise them. The district attorney decided what evidence to admit and what to exclude.

Mr. J. H. Franklin, manager of the "Harlem Line," was the first witness to testify concerning the conditions in the tunnel. "Harlem Line" is the term for the administrative organization, participated in jointly by both companies, covering the line from the terminus at Forty-second street to Mott Haven; and Mr. Franklin has had charge of this line for many years. His title is "manager," but his authority appears to be such as is usually exercised by a division superintendent; that is to say, an engineman, as, for example, Engineman Wisker in this case, is under Mr. Franklin's authority while he is running in this territory; but important cases of discipline are apparently referred in every case to the division superintendent to whom the engineman reports. From some of the testimony it appears that, as regards maintenance of the signals, Mr. Franklin's territory now extends only as far north as Fifty-second street, so that the signals in the tunnel come under the authority of the chief engineer and the signal engineer of the New York Central.

Mr. Franklin found the brakes of the New York Central train in working order after the collision. Answering questions, Mr. Franklin said that he had received complaints from enginemen that on foggy days they had difficulty in seeing the signal lights. He thought the atmosphere in the tunnel on the day of the collision to be in good condition. It was not a "heavy, humid" day. Asked what he had done when enginemen complained of difficulty in seeing signals he said, nothing, except that the shortening of the block sections had been considered. Being asked if enginemen who lost time were likely to be put back to running a yard engine, or a gravel train, he replied, "I believe so."

Asked how many trains had run past danger signals within the past month he replied, "five or six." Following this testimony the District Attorney produced records, which had been secured from the railroad company, showing eighteen cases of enginemen running past stop signals within twelve months. Nearly all of these cases appear to have occurred in the side tunnels, and at the stations where the smoke has the poorest chance to escape, such as at Eighty-sixth street. One engineman who ran past the signal the whole length of his train was reprimanded; another, belonging to the Hudson Division, had been put back to running freight trains. In none of the cases brought out did it appear that the delinquent runner had been suspended or dismissed.

The engineman of the New Haven train, Thomas F. Dougherty, being asked if he ever had any trouble with the signal lights replied: I know the feel of the road. If I can't see the lights I get down and look for them.

Q.—Have you ever had to get down and look for the lights? A.—Yes.

Q.—Did you ever run by? A.—Once. I got by the light half the length of my engine. I have been on this run seven years.

Q.—Would you undertake to take a train through the tunnel on a foggy morning, if you had never taken a train through? A.—No, sir, I would not.

Q.—The difficulty of picking up lights occurs every foggy day? A.—Yes.

Q.—What speed do you make in the tunnel? A.—Twenty-five miles if I get no [stop] signals.

Q.—Do engineers try to make up time in the tunnel? A.—No. They're afraid of making black smoke.

The rear brakeman of the New Haven train said that when the Central train approached him the air was so full of smoke that he could see nothing; and the first he knew that the approaching train was on his track was when the engine brushed his coat sleeve. He then threw his lantern at the engine.

Robert H. Myrtle, lampman at Fifty-ninth street, who sees to filling the torpedo magazines, being questioned about the torpedoes said that sometimes they failed to explode. This witness as well as others testified, however, that the torpedo at Fifty-ninth street exploded when Wisker ran over it.

Fireman Fyler, of the Central train, had fired mostly on gravel trains, but had fired on this train one day before the wreck. He had never fired with Wisker until then. The air-brakes had worked all right on the fatal trip. He was unable to see the signal lights at Eighty-sixth street on that morning. He felt sure that Wisker applied the air-brakes at the stop signal (Fifty-ninth street). Two or three railroad officers and employees, on this train, have testified that they did not feel the brakes go on at all. (Some of these railroad men estimated the speed at thirty-five miles an hour clear up to the point of the collision). The examination continued:

Q.—Did Wisker say anything to you after the collision? A.—I recall that he remarked: "I've done it," or something like that.

Q.—What did you say to him? A.—I told him that I had called green at Sixty-third street, but he replied that he hadn't heard me.

Superintendent Miles Bronson, of the Harlem Division, testified that Wisker was assigned to this train after two others had had to be dropped for good cause.

Q.—Who assigns the engineers? A.—I presume I am responsible. Master Mechanic Symonds actually assigns the men.

Q.—What tests do you require of applicants for engineers' positions? A.—Examination by the Master Mechanic as to mechanical knowledge; by Trainmaster Van Tassel as to the rules and regulations, and examination by my chief clerk as to sight and hearing. When accepted the Master Mechanic is notified that he may use the man as an extra engineer.

Q.—Did you pass on Wisker's application? A.—Yes.

Q.—Did you deem him competent? A.—Yes.

Q.—How did he happen to be assigned to that run? A.—I can say only from hearsay. The man first assigned injured his ankle, the second was wanted for some other purpose, and then Wisker was assigned.

The District Attorney charged Mr. Bronson with attempting to conceal the facts about his inquiry, made on the day of the collision; but it was replied that this inquiry was brief because the principal inquiry would have to be made by Mr. Franklin.

Master Mechanic S. W. Simons testified that Wisker had been examined by Road Foreman Whipple, in accordance with a printed list of questions, used for all examinations of candidates for engineman.

S. T. Chase, Master Car Builder, testified that the rear car of the New Haven train was a well-built car. He thought it was eight or ten years old. Questioned as to the construction of the car he said that if it had been built as strong as the newest cars used on the Empire State Express it would not have been so badly crushed; indeed he thought nobody would have been killed by the collision. Asked if directors' cars were not provided with special safeguards, he replied, "Yes." The witness evidently referred to steel framing in the floor and platform. He said that these devices had been in use about four years. Asked why cars for other people were not made as safe as those for directors, he replied that the newest cars were probably as safe as the directors' cars. He thought about one-fifth of the cars of the New York Central had these safeguards.

Chief Engineer W. J. Wilgus, of the New York Central, was asked about the signals in the tunnel. He said that he had not made any changes as yet.

Q.—When you received reports that torpedoes failed to explode what did you do? A.—Referred the matter to Mr. Kinch.

Q.—Have you done anything in the past three months regarding signals in the tunnel? A.—No, sir.

Q.—Why didn't the torpedoes explode on the day of the test by the Coroner? A.—The machine was broken.

Q.—Aren't audible signals placed at the precautionary light in England? A.—Yes. They are not in this country.

Q.—Have you given this audible system any consideration? A.—Yes.

Q.—What's your decision in the matter? A.—That they are undesirable. In England the torpedoes are placed on the track by hands. Two torpedoes at the green light and one at the red would result, on account of the number of tracks in the tunnel, in no little confusion.

Q.—Can you suggest anything that would increase the efficiency of the present system of signals? A.—I think the system is up to the best practice in this country.

Q.—And you've decided to let the system remain as it is? A.—So far as the system is concerned we can suggest nothing to increase the efficiency or to be added to the signal system.

Edward W. Fitzgibbon, locomotive engineer, testified that Wisker had fired for him six months and had often been allowed to run the engine. He had let him run an engine through the tunnel about twenty-five times.

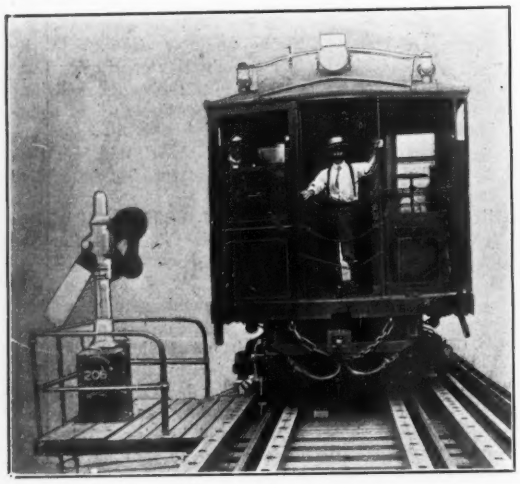
but this was not on a passenger train. Witness regarded Wisker as a perfectly competent man.

General Superintendent C. H. Platt, of the New Haven road, testified concerning the signals in the tunnel. He asserted that they are as good and safe as can be devised for that situation.

The New York Central Accident—Electricity—Protection by Signals.

BY S. S. NEFF, *Lately General Superintendent Boston Elevated Railway.*

The accident in the New York Central tunnel, Jan. 8, 1902, caused a great deal of thinking by electrical experts and railroad operating officers, but up to this writing very few intelligent articles have appeared in the New York daily press. In attempting to discuss the question your writer does so, not from any personal standpoint, but with an idea to give from actual experience some information which may cause other railroad men to express themselves.



Sketch A.—Semaphore Clear, with Automatic Stop Down.

I agree with Mr. Prout in his letter of Jan. 16, to the *New York Times*, that Mr. Westinghouse would be the last man to discourage the use of electricity as a motive power for suburban rapid transit, and in his second letter, dated Jan. 18, appearing in the *New York Times* of Jan. 19, his advocacy of incombustible cars appeals to all who are familiar with electrically equipped trains. His warnings in each case are well founded and no exception taken by the press should be recognized by electrical engineers, except to cause them to carefully heed the warnings of one who has attained pre-eminence in his work and whose interest in the safety of his fellowman outweighs that of a manufacturer of electric equipment for money profit.

Electricity is here to stay, but the more you are thrown in contact with it the more you realize the precautions necessary to control it. Electricity is made use of in that the cost of operating trains per car mile by electricity is greatly reduced as compared to operation by steam power. The operation by electricity is free of smoke and gases, except when short circuits take place, which at times, more especially in a tunnel, are undesirable. The quick acceleration of trains is in addition an attractive feature.

The greatest disadvantage in the operation by electricity as compared to steam, is that power is supplied from central points and where power houses are in trouble, the whole system is liable to be tied up, which often causes trains to be stalled between stations, or at points where it is undesirable to unload passengers. My idea of bringing out the above point was to touch lightly upon the troubles which occur and which are not dangerous but exasperating, and later on to speak of the dangers surrounding the operation of trains by electrical force.

Theoretical experts have done a great deal to delay the proper installation of electricity. Power houses are being built to supply electricity only to the peak load to be moved, in consequence of which overloaded generators have caused the holding in of breakers in power houses to such an extent that the machines have been injured and the plants have finally become wrecks. Theoretical figuring and the installation of copper to minimize the cost of construction, has been in the same line of installation as in the case of power houses. One of the greatest drawbacks for the successful operation of electrical roads is that there is lack of harmony between the construction departments and the operating department. Rapid transit roads other than steam railroads have always been considered as between the steam road and the horse-car line, and it has been considered necessary to institute a few of the steam railroad's precautions as to safe operation; but I think you will agree with me that electricity as a motive power and the attaining of high speed by electric trains with close headway, should demand the hearty co-operation of construction and operating officers, and the installation of the latest improved arrangements and devices for prompt and safe movement of trains. When I speak of the lack of harmony between electrical constructors and operating officers, I do so from experience. When troubles occur with steam where trains are running at close headway, the operating officer must have every available loophole to divert and rearrange the movement of each individual train affected; with electricity the needs are infinitely greater and when roads are built and not sectionized, with reference to feeder system, and where, on account of a short circuit, breakers in power houses are blown out, causing the stoppage of all trains, one can appreciate the exasperating situation.

One of the greatest causes of electrical troubles has been that the roads have been opened too soon. Franchises have been secured, and up to a short time before franchise expired, the operating department was not on hand and when it arrived, the time was too short in which to properly arrange details, the road is opened under adverse circumstances which develop electrical troubles on account of faulty installation.

The operation of roads by electricity must be by competent employees. They must be examined as to eyesight, hearing and temperament, and after proper schooling, must be subject to rigid examinations to prove their competency. The troubles that have occurred in the operation of electric roads, though small in their nature to begin with, have, on account of the ignorance and slowness to act on the part of employees, been the cause of damage to life and property. This not only refers to trainmen, but to station employees and others.

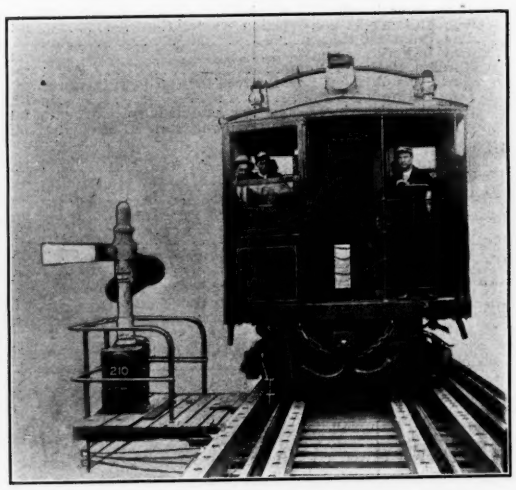
I speak of station employees in reference to duties they should perform when short circuits take place, and where the sectionizing of feeder system should be such that not only the junction points, but stations as well, should be provided with breakers and switches to cut out any portion of the line where electric short circuits take place. Short circuits are liable to happen at any time, more especially where the third rail system is used. Short circuits on the third rail system can be reduced to a minimum. All parts of track, whether on an elevated road, a surface road or in a tunnel, are fixed except switches and switch connections, which move, but do not give contact to third rail. We should avoid foreign movable pieces of metals which would tend to ground the circuit. All track tools, including rail tongs, bars, wrenches, should be well wrapped with insulating tape. In the operation of trains, the parts which are most likely to give trouble are extension gates between cars, hog-chains and brake-beams. Extension gates should be so constructed as not to allow them to uncouple and drop on the third rail, even if it becomes necessary to lock them. Hog-chains should be so made as to remain intact even if train should part: the hook on hog-chains should be so made to make separation impossible. There should be no reason why brake-beams should drop; keep motor casings far enough away from the flange of wheels to allow a brakehead bolt to be supplied with nut and nut lock. Greater care must be taken by the builders of motors not to make them too sensitive. While a great deal of short circuiting of motors is caused by the fact that they have not been properly inspected and cleaned, at the same time the manufacturer cannot be too careful in the construction. Motors short circuiting invariably fill the cars with smoke and gases which cause stampedes of passengers.

Defective car wiring has been the cause of more short circuits in cars than anything I can recall. I therefore advocate that no wiring should be done by contract. All wires should be supplied and put in position and thoroughly tested by competent men employed by the operating department of the road, and such men to be continued in service, which idea in itself would insure better workmanship. There is a bad feature which affects car wiring, extreme vibration causing a breaking of wires. This not only takes place where wheels develop low or high spots on the tread of wheel, but on account of bad line and surface in track, which I fear will be more readily appreciated later on by some of our roads who are about to change from steam to electricity. The vibration referred to has, in a great many instances, severed connecting wires with control, motor leads and shoe leads, all of which must be cared for in the best possible manner in construction, and unless false economy is followed out, wheel treads and irregularities of track must be carefully remedied.

When I read of cars burning up on account of short circuits, I feel that someone is directly responsible. Fire never develops where smoke or gases cannot be noticed. Trainmen, platform men, trackmen or interlocking men who cannot see or detect such a condition, are incompetent. If a car develops a short circuit it is a simple matter to pull out a main switch or breaker. Wooden paddles should accompany each car to be used to break contact between the third rail and shoe, and the motorman should be instructed to stop, smother the fire, not using water under any circumstances, and not proceeding with his train until the fire is out. A locomotive unit system in the operation of electric trains on account of the likelihood of short circuits, is of course preferable to a multiple unit system, where each car is a motor in itself, all working in harmony and offering quicker acceleration than the locomotive unit. With the necessary precautions from the beginning and following out careful inspection and operation, we must see electricity confined to safe operation of rapid transit systems.

We find the same unfortunate condition in the New York Central tunnel which is found in the London underground circuits and the Boston Elevated Railway subway section, namely, a tunnel section established and we must construct electrical equipment to fit the section and meet requirements for electrical installation, which in each case is adverse and where short circuits should not take place, and which, on account of its tunnel section, should be equipped with breakers and switches at close intervals, said breakers to be adjusted at a lower blow-out point than is usual under outside conditions, and as an additional precaution, all breakers and switches in the New York Central tunnel or any other tunnel, operated by electricity, should be manned by competent electricians to be in a position to know exactly when to put the breakers in and when to take them out. A good many cases have taken place where breakers have been blown out in power houses and where, by throwing them in without knowing the situation, a second explosion has taken place at the point of short circuit, which has to a great extent increased the volume of smoke and gas, and the stampede of passengers, which is especially undesirable underground.

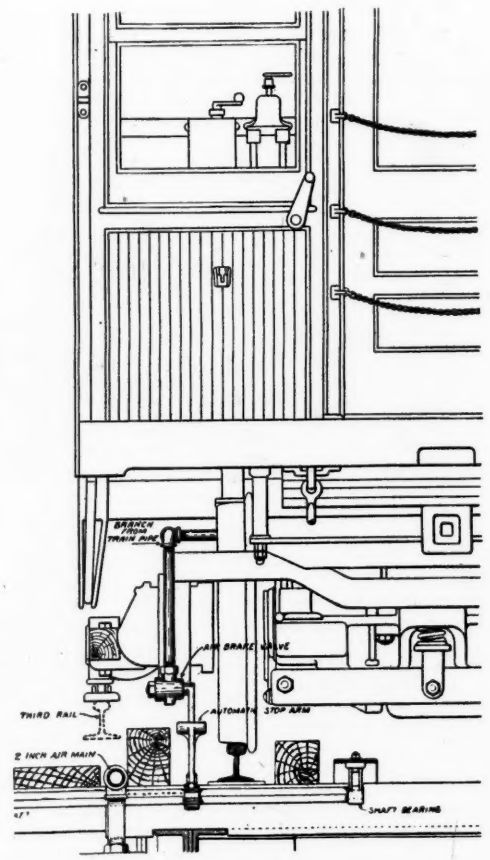
As it has been suggested that the operation of trains by electricity in the New York Central tunnel would take away all chance for a re-occurrence of the sad disaster, and following up Mr. Westinghouse's article which refers to the possibility of a collision between two elec-



Sketch A1.—Semaphore at Danger, with Automatic Stop Up.

trically fitted trains and the results therefrom, I feel it my duty to say a few words in connection with proper protection of trains by way of signaling and an automatic stop device.

Admitting the progress which has taken place in the signaling of our American roads, what do we find? The

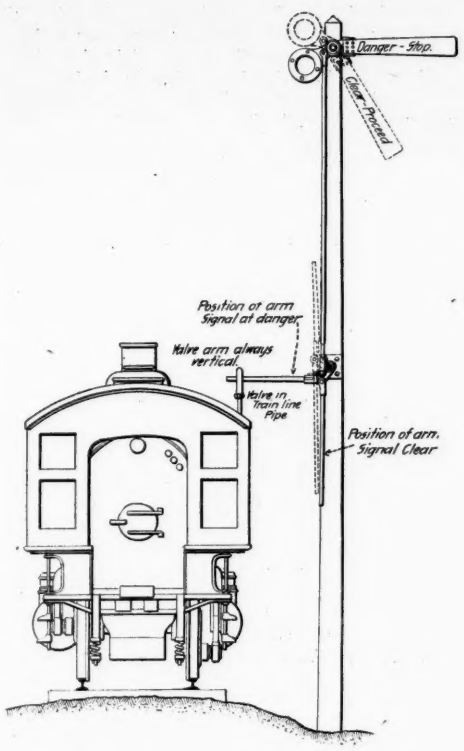


Sketch B.—Train Line Pipe Connection to Automatic Stop Valve on Boston Elevated Cars.

engineman must still be infallible to secure safe results. But there may be contrivances to make safe the operation of trains, whether on double or single track, on curves or grades, or in tunnel, the latter of which, where trains are run at close headway make it doubly hard for the engineman to see. I feel it my duty to advocate in the strongest possible manner the adoptiton of an automatic stop device in connection with all block signals on steam and electric roads. It has struck me that on account of the small cost which is incurred and the absolutely safe

results obtained, there has been a great oversight on the part of railroad men. Having always been an advocate of an automatic stop appliance, I was more thoroughly convinced of the absolute need of its usage when I had the honor of opening the Union Elevated Railroad of Chicago, in October, 1897, where at the commencement we had 1,400 trains every 24 hours and where, during the evening rush hours we passed 30 trains every 14 minutes through each of the two junction points. In addition to the automatic stop appliance installed, we had torpedo machines and if a train passed a signal at danger a torpedo would be exploded. While in the majority of cases the explosion of a torpedo would warn a motorman that he had passed a signal at danger and he would stop his train, we had several cases where the warning was not heeded and the motorman proceeded, the automatic stop being the only sure prevention of collision.

In the spring of 1900 in going to the Boston Elevated Railway as consulting engineer and later on as General Superintendent the writer was confronted by a most serious problem as to the operation of high-speed electric trains with a maximum speed of 50 miles an hour with 5 per cent. and 8 per cent. grades, reversed curves in the subway of 90 ft. radius, with no elevation, and headway of trains one minute apart, demanding something out of the ordinary by way of signals and automatic stop devices. The adoption of the electro-pneumatic system of block signals being decided upon and the location of signals to space trains one minute apart being completed, the automatic stop feature hung fire for some time but was finally adopted and I feel safe in saying that to-day the Boston Elevated Railway Co. officials could not be induced to part with this appliance; the road now having been in operation nearly a year with the first collision to take place. There were cases where motormen ran by signals at danger, the automatic stop feature causing the train to stop at once. Investigation brought out testi-


Danger - Stop.
Clear - Proceed
Position of arm Signal at danger
Valve arm always vertical
Valve in Train line Pipe
Position of arm. Signal Clear

Sketch C.—Proposed Automatic Stop.

mony from the motorman that he did not see the signal. The device is of a very simple nature and is illustrated by sketches.

Sketch A and A^1 show the location of the automatic stop or arm which is connected on a rocker shaft directly to each signal. When the signal is clear, sketch A, the arm lies in a horizontal position and offers no obstruction. When the signal is at danger, sketch A^1, the arm stands in a vertical position and if a train passes the signal, the arm strikes a projecting arm which opens a valve in train line pipe, applying at once the automatic air-brakes.

Sketch B shows the location of the train line pipe valve and projecting arm as in operation on the Boston Elevated Railway cars. The device is very simple and is not covered by patents. The cost of equipping a car is $5, and the cost for equipping each signal should not exceed $25 under any condition of signals. As it might be objectionable to have the automatic stop device on steam roads arranged in the same manner, I suggest that the attachment on engines be arranged on the cab of the engine and the trip on the signal post instead of on the track as noted in sketch C. Some will say such an arrangement will be constantly getting out of order and cannot be relied on; my answer is the simplicity of the contrivance is such that it will require less repairs than the ordinary air-brake attachments, but must be subjected to regular and careful tests to prove that each part is in working condition. The device being so inexpensive and simple in its construction and bringing forth positive results to the saving of lives and property should appeal to those at this time who have the right to contract for the installation of such a safety appliance without being forced by indignation meetings or legislation to adopt same.

It has been suggested by many that the operation of the New York Central tunnel by electricity instead of steam would add greater safety to the movement of trains. Admitting the fact that the use of electricity would dispense with smoke and gases which prevail with the operation by steam, I would be still of the opinion that the change from steam to electricity would not change the fact that the engineman is not infallible and without an automatic stop device would still be liable to run by a danger signal and cause collisions. In taking the stand that I have to make safe the lives of passengers I know that the exception taken will be met with considerable criticism on the part of many steam road men who have always been adverse to such a device. Experience has taught me that the idea advanced is on the side of safety and I will be willing at any time to champion the installation of such a safety device although directly opposed by my fellow fraternity-men.

In conclusion, let us fully appreciate Mr. Westinghouse's warning and realize that operating officers of electric railroads must see that all electric installation is perfect, and that the latest improved signals and safety devices are instituted, and in addition that the organization of operating forces, even to the lowest in the ranks, must be competent to meet any emergency. Selections of force should be made from young men, paid living salaries, which, in return, should demand and secure perfect results. You will then provide rapid transit by electricity without fear of injury to life or property.

Shop Practice for All-Steel Cars—Boiler Design.

Two special committee reports were made at the annual meeting of the Central Railway Club, Jan. 10, at Buffalo, as follows:

Best Method in Shop Practice in Meeting the Requirements and Maintenance of All-Steel Cars; Probable Future Shop Changes Necessary.

As the steel cars are comparatively new they are not in a general worn-out condition and do not require overhauling, but are in need of repairs to certain parts due to wrecks, rough handling or possibly some fault in the design. The whole question of repairs to this class of cars is still somewhat in its infancy, and it will require quite a period of time to determine in what manner they will stand the effects of corrosion and general wear of the complete structure.

One fact appears to be very clearly established and that is the question of facilities for repairs is not as serious a one as was first anticipated. It is found that for the present with the aid of pneumatic drills for drilling and reaming the rivet holes, pneumatic riveting hammers, and a forge or a large torch burning crude oil or gasolene, it is practicable to handle without difficulty any steel cars that are brought to the repair track for repairs.

When side sills, end sills, center sills, stakes, plates, etc., are bent, providing the material is not torn or too badly buckled, it is found that the bent parts can be heated with the aid of the above tools mentioned, and readily straighten while hot without being taken down.

If the damage is found too extensive to repair in this manner, the parts requiring repairs can be cut out and placed in a large furnace to be heated, after which they can be straightened and replaced. The urgent necessity of all car shops having facilities to cover this work is one that should be taken up immediately and overcome the necessity of sending cars to the manufacturers or delaying the repairs by having the motive-power department cover the same.

It is also found at the present time that it is not absolutely necessary to carry a large stock of repair parts for the purpose of repairing these cars, but as the percentage of this class of cars increases, your committee deem it very essential that sufficient machinery in the way of hydraulic presses, shears, punches, etc., should be provided for getting out the different parts needed from regular sheets and bars of steel that can be bought in the open market.

The question of corrosion is a very serious one in connection with this class of equipment and no delay whatever should be tolerated in procuring ample paint shop facilities for taking the cars in as often as is necessary. The prevailing opinion appears to be that the cars should be painted if practicable inside and out, once in 18 months. In covering this work the fact must not be lost sight of that the corrosion, scale and all parts must be cleaned off thoroughly before applying the paint, so it will take hold in the manner expected.

Your committee would recommend for this purpose, that a sand blast or some other suitable method should be used.

Would further recommend that the pneumatic painting machine is a decided improvement over the hand method of painting these cars, as the cost of labor and material is not only much less than the hand method, but the atomized paint is forced into the crevices and other parts which would not be reached with the brush. The life of the material in these cars largely depends on thoroughly painting all parts.

In making changes in shop buildings with a view of handling steel cars an overhead traveling crane would be of great convenience in handling sheets, etc., although, in all probability, not an absolute necessity.

Your committee thinks in order to meet future requirements, a shop provided with machines referred to above and the necessary furnaces together with overhead traveling crane would be sufficient.

This committee was G. N. Dow, James Macbeth and H. A. Fergusson.

Best Improvement of Boiler Design and Best Proportion of Heating and Grate Surfaces for Different Kinds of Coal.

The demands made to furnish locomotives capable of hauling greater tonnage oftentimes with an inferior grade of coal, has necessitated making a radical change in boiler construction, using higher steam pressures, larger grate area and larger capacity boilers from those in vogue a few years ago.

The general tendency to design of boilers for heavy passenger and freight service may be seen in the introduction of the wide fire-box in large capacity boilers and also in the radical change seen in the Vanderbilt boiler of but recent introduction. In connection with the Vanderbilt boiler we learn that this boiler, now in use on the Hudson River division of the New York Central is giving satisfactory service. Such being the case, and if it is decided that it is found practicable to use this type of boiler, the abandonment of staybolts would be one of the greatest advantages obtained in the construction of boilers yet introduced.

The present improvement in fire-box design as is well known has been made possible by the substitution of a trailing wheel under the fire-box, of a smaller diameter wheel than the driving wheel, or by carrying the centerline of boiler sufficiently high to permit using a moderate diameter coupled wheel under the fire-box, thus allowing the construction of a fire-box having sufficient grate area and depth from flues to grate to successfully burn different grades of bituminous coal. With the use of the wide fire-box it also allows the use of easy curves of the outer and inner walls of the fire-box, increased water space and longer staybolts.

Longer flues giving greater heating surface are also being successfully used, and as the length of flues now being introduced has been but of a comparatively recent application in American practice, the question is one that we may receive much benefit from by a discussion of this subject.

With the wide fire-box design on passenger engines for high speed it has been made possible to get grate area of sufficient size to reduce the rate of combustion to economical limits with greater boiler capacity, insuring free steaming, and by reducing weight by substituting steel for cast-iron in various parts of the engine, the least amount of weight per square foot of heating surface has been obtained.

Your committee are of the opinion that a moderately sized single door would in some cases be more of a benefit than the use of the double doors on a wide fire-box boiler as well as being more economical to build.

The question of the best proportion of heating and grate surfaces for different kinds of coal is a subject that your committee have not had the time or opportunity to obtain enough data to formulate a report upon.

So many factors that bear an important relation to the combustion of coal, enter into this subject, that your committee feel that it would be best to give only what we have learned to be the general ratios of heating and grate surfaces that is now being practiced, namely, for anthracite coal, about 40 to 1; good bituminous coal, 60 to 70 to 1; run of mine coal, 60 to 1, and for soft coal slack all the grates possible.

The committee was C. H. Hogan, J. H. Moore and H. A. Fergusson.

The Railway Transportation Association.

The regular winter meeting of this Association was held at Chicago, Jan. 15. There was a good attendance of representatives from Western and Southwestern roads.

During the discussion on the subject of Transfers, which this Association has had under consideration for some time, the fact developed that in certain directions the delivering lines are increasing the number of transfers and to that extent relieving the receiving lines from responsibility for transfer, which heretofore has been recognized by custom in the Central West. This state of affairs appears to have been induced by the car shortage.

Ways to induce the loading of cars to their full capacity were exhaustively discussed. One of the greatest difficulties encountered in this connection appears to be the minimums for carload freight which have been established for years. On heavy freight a number of the minimums could be increased to good advantage. It is hoped that with the co-operation of Classification Committees, which will be sought to this end, some effective results will be obtained in the near future.

In connection with the subject of Tonnage, on which the Association is already on record, having outlined through its Committee a thorough method of compiling statistics, there was exhibited at this meeting a resistance indicating machine, recently devised by Mr. J. M. Daly. This is an arrangement of blocks, with a scale somewhat like a slide rule, for getting the total resistance of a number of cars without using a pencil. To transportation officials who have been confronted with the problem of assembling carload freight of varying commodities and mixed gross weights into train loads, having in view the utilization of motive power to its full capacity and yet confronted by the possibility of overloading the

same, a device of this character is a desideratum, and Mr. Daly's apparatus seems likely to be extensively tried in the near future.

On the subject of Car Service, the Association listened to a paper from Mr. David Crombie, of the Pere Marquette Railroad, embracing a compilation of statistics from Interstate Commerce Commission Reports and Poor's Manual, covering a period of thirty years, indicating that there has not been the marked decline in service of cars, as gauged by the average miles per car per day, which has been recently claimed in certain quarters.

The next meeting of the Association will be held in Chicago, July, 1902.

Some Factors Affecting the Power of Locomotives.

In our issue of Jan. 10, we published a short abstract from a paper presented by Prof. W. F. M. Goss before the December meeting of the New England Railroad Club, and last week we published another. This paper deals so clearly with the factors affecting the power of locomotives and contains the results of so much original research that we now give the diagrams which accompanied the paper and a more complete abstract.

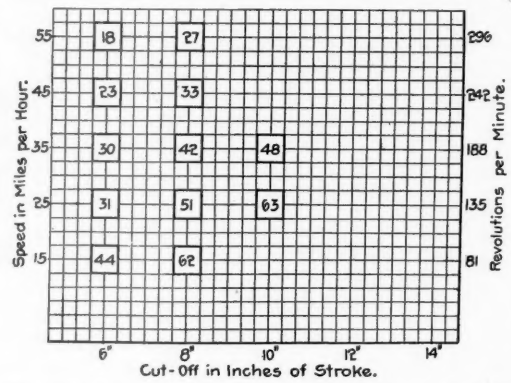
Attention is first called to the fact that the locomotive is a complex machine, embodying within its own structure a boiler, a pair of engines and means for transmitting the energy of the engines to a point where it may be used. These essential features of every steam-power plant are developed within narrow limits of space and in a manner which adapts them to severe and exacting service. It is a high tribute to the skill of locomotive designers that in spite of limitations imposed by gage of track, by the width and height of clearance space, and by restrictions as to weight, the American locomotive has steadily increased in power until it has become the most marvelous machine that the world has ever seen. Its ability to keep in motion a slowly moving load of several thousand tons, or to run freely at the head of a lighter and more rapid train, results from the consumption of enormous quantities of coal and water. A hundred pounds of coal and two standard barrels of water are often required each minute that the locomotive is in action. If the exhaust steam delivered from its stack were in the form of solid masses of water, these would often emerge, a gallon at a time, at intervals of less than a second.

It is clearly explained that with a given engine at a constant speed, the power is proportional to the mean effective pressure, which suggests an inquiry as to conditions affecting the value of the mean effective pressure in locomotive cylinders under working conditions. The discussion of this question most conveniently involves a consideration of data obtained from the Purdue experimental locomotive, Schenectady No. 1. The principal dimensions of this locomotive are as follows: Total weight, 85,000 lbs.; weight on drivers, 56,000 lbs.; diameter of drivers, 63 in.; cylinders, 17 x 24 in.; diameter of boiler, 52 in.; grate area, 17.5 sq. ft., and heating surface, 1,214 sq. ft.

Fig. 1 presents values for mean effective pressures, as disclosed by a series of 12 tests run at different speeds and cut-offs. Comparisons along horizontal lines show the effect of increasing the cut-off at constant speed. Again, comparisons along vertical lines show the effect of changes in speed when the cut-off remains constant. For a 10-in. cut-off, speeds of 25 miles and 35 miles only are shown; it being impracticable to extend points at this cut-off for speeds much below 25 miles or much above 35 miles, since, for speeds lower than 25 miles, the energy developed in the cylinders becomes so great that, under the conditions of the testing plant, the drivers slip, an attempt to run tests above 35 miles failed because the boiler could not supply steam.

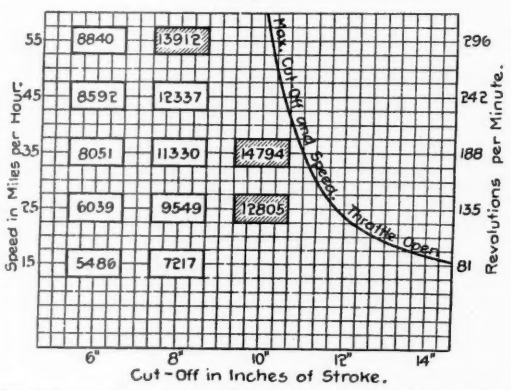
We may now see why it is that the power of a locomotive is not proportional to its speed when the cut-off remains unchanged. Thus, referring to Fig. 1, and comparing tests for which the cut-off remains constant, it will be seen that each increment of speed results in material loss in mean effective pressure. This is a result of wire-drawing. All forms of valve gear usual in locomotives give a straight steam-line only when the speed is very low. As the speed is increased, the steam-line falls, the amount of steam taken into the cylinder each revolution is diminished, and the exhaust becomes less complete. It is but proper to add that an exhibit such as appears in Fig. 1, presenting results obtained from a more modern engine with greater valve travel, or with an Allen-ported valve, or with a well-designed piston valve, might show the mean effective pressure to be somewhat better sustained under the influence of increasing speed than the results which are here given. But all differences in the performance of different engines are in this respect only matters of degree.

The maintenance of pressure in the cylinders demands steam from the boiler, and hence the limit of cylinder work is reached when the boiler can no longer meet the demand which is made upon it. The pounds of steam generated per hour by the Purdue locomotive is represented by Fig. 2. The extent of the demand which the cylinders make upon the boiler under different conditions of speed and cut-off is here clearly shown. The points represented by the shaded rectangles are those for which the hourly evaporation is more than 12,000 lbs. of water,* and represent a close approach to the maximum power of the boiler when fired with Indiana block coal. But with better fuel it is probable that a total of 18,000 lbs. of water per hour can be reached, which is equal to the evaporation of 15 lbs. per foot of heating surface per hour. Accepting this latter value as representing the maximum capacity of the boiler of the Purdue locomotive, then the points of cut-off and speed, for which this boiler will serve to meet the demands of the cylinders under a fully-open throttle, will be represented by the curve in Fig. 2. Thus, at 25 miles, steam can be supplied for a cut-off of almost 12 in.; while, at a speed of 50 miles, the cut-off cannot be longer than 10¼ in. An attempt to employ longer cut-offs will result in failure through lack of steam. This curve represents maximum performance, under a wide-open throttle, for the engine in question. It shows also the effect of changes in speed upon the total consumption. Thus, comparing tests for which the cut-off is the same, it will be seen that the demand upon the boiler is not greatly increased by increasing the speed. The reason for this has already been explained; but it will be of interest to note that the upper portion of the curve of maximum performance is so nearly vertical that, after the speed has reached 25 miles, but slight reductions in the cut-off are required to enable the boiler to meet the demand of the cylinders under further increments of speed. Doubling the speed from 25 miles to 50 miles



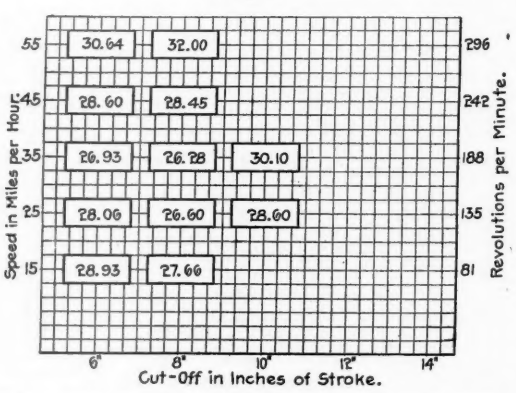
Mean effective pressure at different speeds and cut-offs, Schenectady No. 1. Boiler pressure, 130 lbs. Throttle fully open.

Fig. 1.



Total dry steam per hour, Schenectady No. 1. Boiler pressure, 130 lbs. Throttle fully open.

Fig. 2.



Mean effective pressure, Schenectady No. 1. Boiler pressure, 130 lbs. Throttle fully open.

Fig. 3.

necessitates a reduction in the cut-off of less than 2 in.; whereas, if it were not for the wire-drawing action, it might be expected that doubling the speed would necessitate the use of half the cut-off.

With a constant weight of steam available, which for the Purdue engine is assumed to be maximum at 18,000 lbs. an hour, it is evident that, at the limit, the total power developed will depend upon the efficiency of the engine. Thus, at the limit of boiler capacity, when all steam generated is being consumed, the maximum power of cylinders which require 40 lbs. of steam per horse-power per hour can only be half as great as that for cylinders requiring but 20 lbs. of steam per horse-power per hour. It is for this reason that, at the limit, economy in the use of steam becomes a factor in determining the maximum output of power.

The steam consumption of the Purdue locomotive at different speeds and cut-offs, with 130 lbs. boiler pressure and a fully-open throttle, is shown by Fig. 3. As in the diagrams previously presented, the field covered by these results represents the whole range to which, in service, the locomotive is likely to be subjected. The variation in economic performance throughout this wide range of action is extremely small. Moreover, the values presented show the locomotive to compare favorably in its performance with that of other types of high-pressure engines.

The power developed by the Purdue engine under different conditions of speed and cut-off, and under a fully-open throttle, is shown by Fig. 4. Under the conditions of maximum steam supply, as defined by the previous diagram, the greatest power which can be obtained, without exhausting the boiler of steam, is approximately 500 h.p.; and the cut-off and speed necessary to give this power is shown by the curved line, Fig. 4. The lower straight line represents cut-off and speed as limited by the adhesion of the drivers, which are assumed to slip when the tractive force reaches 12,000 lbs. The entire range of action of this engine under a full throttle is represented by the area of that portion of the diagram which is to the left of these curves.

All of these results are from an engine which is considered small in comparison with modern constructions and carrying a low steam pressure, but which is nevertheless in many essential respects typical of present practice.

The results already described, as obtained experimentally from the Purdue locomotive, will, if properly interpreted, serve as a means whereby the performance of any locomotive may be predicted. A summary of the more important conclusions is to the effect that any ordinary locomotive boiler may be depended upon to evaporate each hour 12 lbs. of water for each foot of heating surface; that, when working at full power, under the varying conditions of speed and cut-off at which that power may be developed, it requires approximately 27 lbs. of steam per indicated horse-power per hour; and, consequently, that 1 h.p. may be developed in the cylinders for each 2¼ sq. ft. of heating surface in the boiler. By this process it becomes possible to determine the power of any locomotive from the known area of its heating surface. Power thus determined should be equivalent to the indicated power; but, since the indicator does not enter into the measurement, it will hereafter be referred to as the cylinder horse-power, or as the C. H. P. The general equation for the power of a locomotive becomes the quotient obtained by dividing the cylinder horse-power by hour (12 × sq. ft. heating of boiler) and the pounds of water consumed per horse-power per hour (28); or C. H. P. = 0.43 H where H is the square feet of heating surface in the boiler.

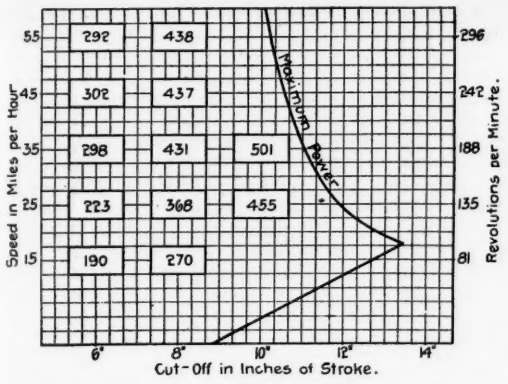
This equation is assumed to apply to simple engines only. It does not apply with strict accuracy to any particular engine, or to any specific condition of running. It is merely an approximate measure of the maximum power which will be developed by a fairly representative modern engine under ordinary conditions of service. Its use is justifiable because of certain interesting and useful comparisons it permits. Its application to the New York Central's Atlantic type passenger engines gives a little over 1,500 h.p. as the capacity of that engine.

For any engine the draw-bar stress is 375 times the quotient obtained by dividing the cylinder horse-power by the speed in miles per hour. The result, stated in the form of an equation, is

$$\text{Pounds draw-bar stress} = 375 \times \frac{\text{Cylinder horse-power}}{\text{Speed in miles per hour.}}$$

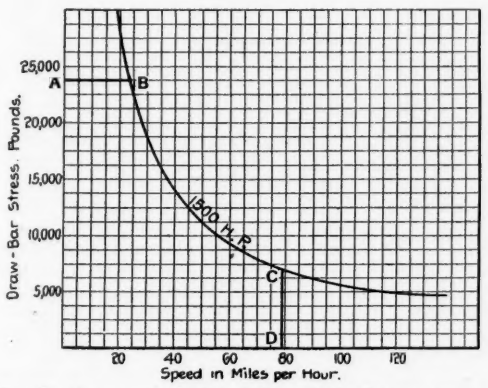
When applied to the New York Central's Atlantic type passenger engine at a speed of 10 miles an hour, this equation gives a draw-bar stress of 56,250 lbs., and, at 50 miles an hour, of 11,250 lbs., while results for all speeds are represented by the curve in Fig. 5. This diagram, applying only to the New York Central engine, represents the maximum tractive effort of this engine in ordinary service, assuming that all the energy of the cylinders appears as a stress on the draw-bar. So far as the mathematical relations involved are concerned, the curve may be extended in either direction indefinitely, but practical considerations establish limits. The limit of its extent upward is found when the tractive force equals the adhesion of the locomotive, and the limit of its extent to the right is reached when the speed of revolution reaches a fixed maximum. The maximum adhesion is usually assumed to equal one-fourth the weight on drivers, which, for the New York Central engine with its 95,000 lbs. on drivers, is 23,750 lbs. By use of its traction-increaser and of sand, this value may be greatly exceeded, but the normal limit as shown will serve the present purpose. The maximum speed is somewhat more difficult to fix. It has been stated, as a rule of practice followed by a locomotive builder, that the diameter of the drivers in inches is made to equal the maximum speed of the locomotive in miles per hour. Upon this basis, which allows all engines a maximum speed of rotation of 336 r.p.m., the limit of speed of the New York Central engine, with its 79-in. drivers, is 79 miles an hour, and the diagram should be cut off at this point, that is, along the line C D. Within limits thus defined, the curve is a perfect definition of the theoretical maximum pulling power of the engine under consideration. It shows that the engine may be started from rest at its maximum tractive force of 23,750 lbs., and may continue to exert this force until a speed of 30 miles an hour is reached. At this speed (point B) the power, which at lower speeds has been less than that which the cylinders

*That the rectangle (12.337) on the 8-in. cut-off and 45 m. p. h. lines was not shaded is evidently an oversight.—Editor.



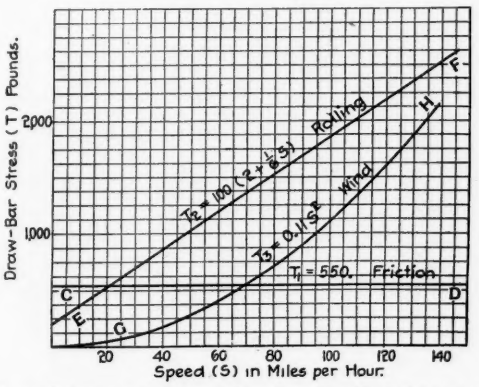
Total indicated horse-power, Schenectady No. 1. Boiler pressure, 130 lbs. Throttle fully open.

Fig. 4.



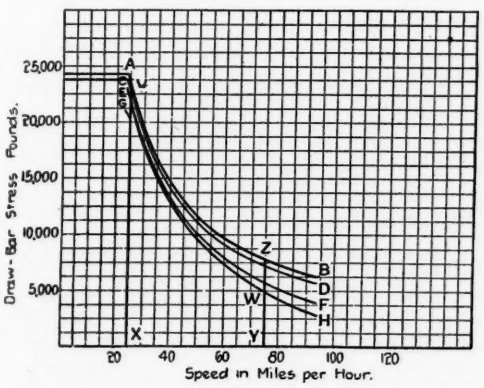
Tractive force equivalent to 1,500 cylinder horse-power, assuming no loss between cylinder and driver. New York Central Atlantic type passenger engine.

Fig. 5.



Losses between cylinder and draw-bar, New York Central Atlantic type passenger engine. T_1, machine friction; T_2, resistance of the rolling load; T_3, wind resistance.

Fig. 6.



Tractive force for New York Central Atlantic type passenger engine, based on cylinder power as corrected for friction, rolling load and wind resistance.

Fig. 7.

are capable of exerting, becomes maximum at 1,500 h.p. Beyond this point, each increment of speed is attended by a loss in tractive force, until at the maximum speed of 79 miles it becomes reduced to 7,000 lbs. It is worthy of especial note that the reduction in draw-bar stress with increased speed is not due to any reduction in the power of the engine, but is in response to a physical condition which must always prevail; namely, that, when the available power is constant, the force in action must diminish as the velocity increases.

In this discussion of the effect of speed on tractive efforts, it has thus far been assumed that no loss occurs in transmitting the power of the cylinder to the draw-bar. As a matter of fact, there are losses between the cylinder and draw-bar which may be assigned to the following causes:

1. Machine friction of the engine, including the rolling resistance of drivers.
2. Rolling resistance of trucks and tender.
3. Resistance which the atmosphere offers to the head of the train.

There may be other resistances, as, for example, the flange friction due to side winds, but these are exceptional and are constantly varying in value. For this reason they will be omitted in a consideration of the general case, with which we may now proceed.

The machine friction of a locomotive has been investigated through the medium of rather elaborate experiments made upon the testing plant of Purdue University. The process involved simultaneous observations at the cylinders and at the draw-bar, while the engine was running at a constant speed and under a constant load. Indicators on the cylinders served in giving a measure of the power developed at that point, and an accurate dynamometer was employed to give the pull at the draw-bar. If there had been no frictional loss, these two sets of results, when reduced to the same basis, would have been identical. But they were in fact different, and the extent of the difference represents loss in transmission. These experiments were made with very great care. That the engine might be perfectly free to respond to forces transmitted from the drivers, the engine truck was removed, and the front of the engine was suspended from long rods so located that the least force tending to displace the machine would produce an effect upon the dynamometer, to which the draw-bar was connected. The whole work was many times repeated at many different speeds and loads. From results thus obtained it appeared that, for the Purdue locomotive Schenectady No. 1, the frictional resistance was represented by a mean effective pressure of 3.8 lbs., and that this value remained nearly constant for all speeds and cut-offs. Whether the higher pressures of the more modern engine operate to increase this value cannot definitely be determined, but, judging from the Purdue results, the increase, if any, would be slight. In the absence of more definite information, we can do no better than accept the fact stated as of general application. While it is not likely that such a course can lead to a highly refined degree of accuracy, it is certain that it is not far from the truth. Assuming, then, that the New York Central engine requires a mean effective pressure of 3.8 lbs. to overcome its machine friction, the equivalent draw-bar stress, as determined from the known dimensions of the engine, is 550 lbs. That is, this is the force which must be exerted at the draw-bar to keep in motion the pistons, cross-heads, valves, rods, and all connected machine parts, including the axles and flanges of coupled wheels. The significance of this statement is shown by the line C D, Fig. 6.

The resistance to rolling, offered by trucks and tender, cannot be much different from that of an equal weight of train following the tender, a fair estimate of which is represented by the formula, $T_2 = 2 + 1/6\ S$, in which T_2 is the resistance of each ton weight, and S is the velocity in miles per hour. The rolling load of the New York Central engine, exclusive of that carried by drivers, the resistance of which has been included with the machine friction, is as follows:

Weight on truck	42,000
Weight on trailing wheels	48,300
Weight on tender in working order	110,900
Total	201,200

The formula shows that the tractive force necessary to overcome this rolling load of practically 100 tons, at a speed of 10 miles an hour, is 366 lbs., and, for a speed of 50 miles an hour, 1,830 lbs., values for all speeds being shown by the line E F, Fig. 6.

The resistance offered by the atmosphere to the head of a train was investigated some years ago by means of a model train mounted within a conduit, through which currents of air, of any velocity up to that of 100 miles an hour, could be made to pass. Each element of the train was mounted upon a dynamometer in such a manner as to indicate the value of any force tending to displace it longitudinally. It was assumed that the effects observed by having the train at rest, and the air moving past it, would be the same as would have been observed had the air been still and the train in motion through it. The results showed that the resistance offered by still air to the progress of the locomotive and tender at the head of a train is approximately 10 times greater than that which acts upon an intermediate car of the same train, the formula being, $T_3 = 0.11\ S^2$, where T_3 is the tractive force in pounds necessary to overcome the resistance offered by still air to the progress of a locomotive at the head of a train, and S the velocity of the train in miles per hour. The formula makes the resistance which the atmosphere offers to the motion of a locomotive, at a speed of 10 miles an hour, 11 lbs., and, at a speed of 50 miles, 275 lbs., and for all speeds as shown by the curve G H, Fig. 6.

We have now obtained a measure of the draw-bar stress equivalent to the power developed in the engine cylinders, assuming no loss in transmission, which for the New York Central engine is shown by Fig. 5, and for the several losses which in service occur between the cylinder and the draw-bar. If now we apply these latter measures as corrections to the former, the results should be a measure of the forces actually developed at the draw-bar. The effect of this process as applied to the New York Central locomotive is most easily made apparent by a graphical process in which the curves of Fig. 6 are combined with that of Fig. 5. The result is shown by Fig. 7. In this figure the curve A B is the same as that given in Fig. 5. It is the draw-bar pull as calculated from cylinder work, disregarding engine friction and all other incidental losses. Applying to this curve the correction for machine friction which is defined by the curve C D, Fig. 6, we shall need to measure down on each ordinate a distance from the curve A B of 550 lbs. The result is the line C D, Fig. 7. Similarly, to make a further correction for the resistance of the rolling load, values from the curve E F, Fig. 6, are laid off downward from the curve C D, resulting in the line E F, Fig. 7. And finally, to correct for wind resistance, values from the curve G H, Fig. 6, are laid off downward from the curve E F, resulting in the curve G H, Fig. 7. In the completed diagram

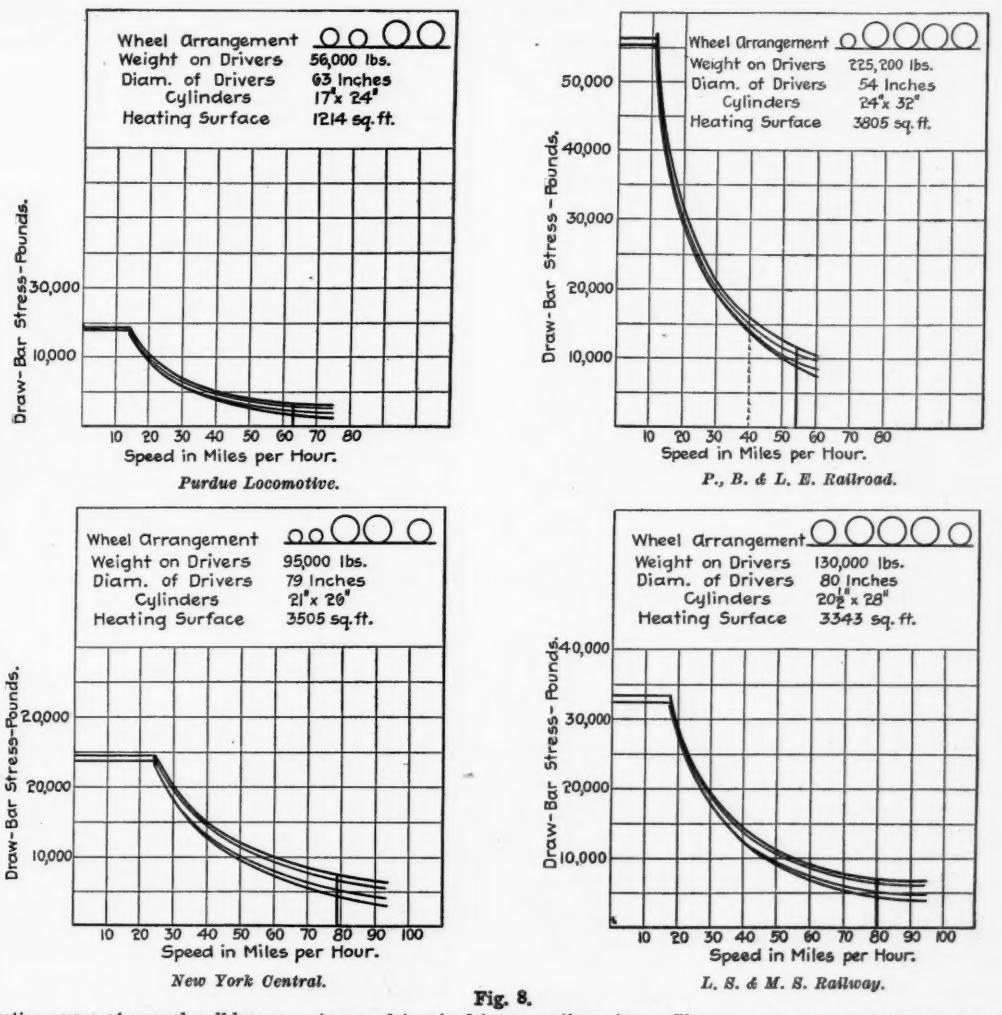


Fig. 8.

Tractive power of several well-known engines, as determined from equations given. The upper curve in each diagram represents the tractive force equivalent to cylinder power; the lower curve, the tractive force as corrected for losses between cylinder and draw-bar.

(Fig. 7) the area between the first curve A B and the second curve C D, represents frictional losses; that between the second C D and third E F, represents rolling resistance of trucks and tenders; that between the third E F and the fourth G H, represents atmospheric resistance; and that between the fourth G H and the horizontal axes, the forces which are available at the tender coupler for useful work in drawing a train. It will be seen that, at a speed of 25 miles an hour, the stress at the draw-bar is 21,500 lbs., while, when the speed is increased to 75 miles an hour, the draw-bar stress is reduced to 5,000 lbs.

Some insight into the cost of running trains at high speeds may be had by comparing the percentage of the cylinder effort, which is lost when the speed is low, with that which is lost when the speed is high. Thus, at a speed of 25 miles an hour, the line U V is only 7.5 per cent. of the line U X, while, at a speed of 75 miles an hour, the line Z W is 40 per cent. of the line Z Y. The relation of lost work to total work developed in the two cases is proportional to the length of the lines referred to. The values shown by Figs. 6 and 7 are applicable to the New York Central Atlantic type passenger engine only, but similar relationships may readily be developed which will be of general application. The general case can best be developed by means of the equations of the several curves involved. The result of their application to four well-known engines is shown by Fig. 8.

A study of the diagrams of Fig. 8 will disclose some of the advantages which attend the use of heavy and powerful engines. Thus, comparing the performance of the Purdue locomotive, a representative engine of 10 years ago, with that of the modern New York Central Atlantic type, it appears that, at a speed of 60 miles an hour, the actual draw-bar stress of the former is reduced to below 2,000 lbs., while that of the latter is not less than 7,000 lbs. At 70 miles an hour the pull of the Purdue engine drops to a thousand pounds, whereas that of the New York Central engine is five times this amount. These are results due to the greater power available, and to the fact that the losses between cylinder and draw-bar are relatively less for heavier engines than for lighter engines.

Some of the effects of different diameters of drivers are to be seen by a comparison of the diagrams of the Pittsburgh, Bessemer & Lake Erie engine and the Lake Shore & Michigan Southern engine. The former, with its 54-in. drivers and its enormous adhesive weight, gives at slow speed a draw-bar pull of not less than 55,000 lbs., which is more than 50 per cent. in excess of the maximum pull of the Lake Shore engine. The small-wheeled engine is able to develop the full power of its cylinders when a speed of 10 miles an hour is reached, whereas this result is not secured by the large-wheeled engine until a speed of 18 miles an hour is attained. Correcting for losses between the cylinder and draw-bar, it appears that, for a speed of 40 miles an hour, the tractive effort of the two engines becomes equal. Again, assuming the maximum speed in miles per hour to equal the diameter of the drivers in inches, the Pittsburgh, Bessemer & Lake Erie engine reaches its limit at 54 miles, whereas the Lake Shore engine continues to run until 80 miles are reached. Actual difference in respect to maximum speed would be greater than that which is shown; for, while the Lake Shore engine with its large wheels and proportionately lighter reciprocating parts may readily attain a speed approaching 400 revolutions, such a speed would be impossible with the smaller wheels and proportionally heavier reciprocating parts of the Pittsburgh, Bessemer & Lake Erie engine. The basis of comparison in this respect is, therefore, more favorable to the small-wheeled engine than it should be. If the maximum speed limit of the small-wheeled engine be fixed at 40 miles an hour, its entire range of action is represented by the area of the diagram to the left of the dotted line, which area is to be compared with the full area of the diagram of the large-wheeled engine. It will be seen that increasing the diameter of the drivers greatly increases the possible range of action, and, further, as it tends to diminish frictional losses it serves in sustaining the draw-bar pull as the speed is increased.

Oil Burning Locomotives on the Southern Pacific.

The renewed interest in oil as a locomotive fuel just now warrants the publication in considerable detail of oil-burning apparatus known to work satisfactorily. A number of roads in the Southwest intend to burn oil, and others more remote from the oil fields are studying the subject with a view to adopting oil if the expectations of those interested in Texas oil are realized. In our issue of Nov. 22 last, the methods and appliances used by the Gulf, Colorado & Santa Fe were described and illustrated and a comparison can be made with the engravings now presented of oil-burning apparatus used very successfully on the western lines of the Southern Pacific.

Mr. H. J. Small, Superintendent of Motive Power of the Pacific System, advises that 149 locomotives were equipped to burn oil on Oct. 1. These locomotives were distributed over the road between Oakland, Cal., and El Paso, Texas. Mr. J. J. Ryan, Superintendent of Motive Power of the Atlantic System of the Southern Pacific, informs us that it is the intention to convert the coal-burning locomotives on the Louisiana and Eastern Texas lines of the Southern Pacific to burn Texas fuel oil. The accompanying engravings show the present practice of the Southern Pacific in the West.

Fig. 1 shows the arrangement of the oil apparatus and the brick work in fire-boxes of mogul locomotives. The burner is located below the mud ring at the rear, the grates are removed and the steel bottom which supports the firebrick is suspended from the side sheets. In the case shown the front wall is 20 in. from the tube sheet. Two air inlets are provided, one at the back of the fire-box and one directly below the arch. The side walls are only made high enough to protect the mud ring rivets. As shown, the pipes for the burner, the heater box and the heating coils in the tank, all branch from the pipe which supplies the blower in the front end, each pipe having an independent valve. The plate on the fire door covers a small opening through which sand is put into the fire-box on the road when it is required to clear the flues of gum. The fire door proper is always tightly closed and when sanding the flues the dampers are closed and the reverse lever is put in the lower notches.

The details of the burner are shown in Fig. 2, air being combined with the atomized oil before it leaves the burner. The steam passage being through the middle both the oil and air are heated. In having an air passage, this burner differs essentially from the two burners illustrated Nov. 22. The heater box is clearly shown in Fig. 3.

The valve controlling the amount of oil delivered to the burner has a vertical rod attached extending up into the cab, and at the upper end of this rod is the regulating handle shown in Fig. 4. When the valve is closed a small stop is inserted in the hole A which insures that the handle remains in the closed position. The oil supply is reduced while drifting and at station stops until the flame is just sufficient to maintain the pressure without wasting steam at the safety valves. To enable this adjustment to be made with certainty the screw operated by the hand wheel is set and locked at the required point. Then whenever the engine is not working steam the handle is brought back against this stop.

The arrangement of oil tanks for tenders of 4,500 gals. capacity is shown by Fig. 5. The main oil tank is made to fit the coal space and an auxiliary oil tank is mounted on top of the tender and coupled to the main tank. These tanks can easily be removed if it is desired to return to

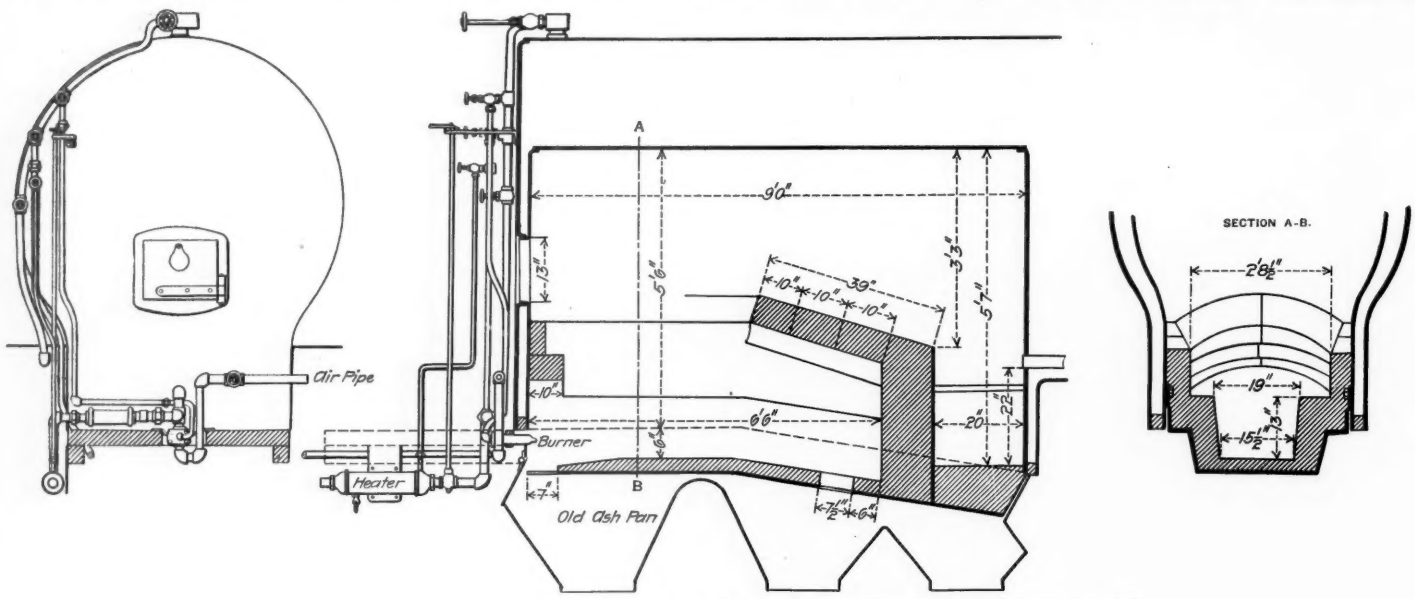


Fig. 1.—Arrangement of Fire-box in Mogul Locomotives of the Southern Pacific.

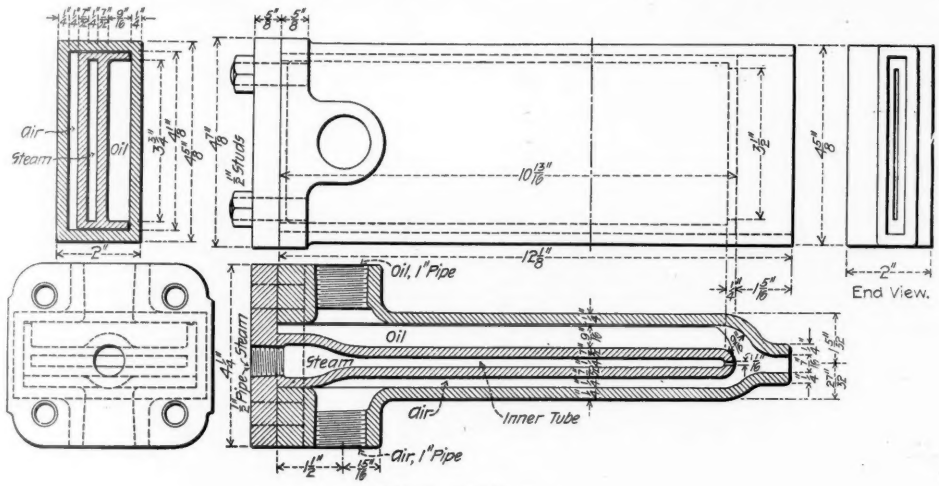


Fig. 2.—Oil Burner.

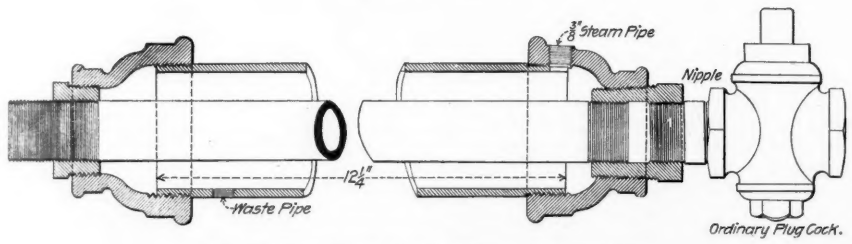


Fig. 3.—Heater-box for Oil-Burning Locomotives.

using coal. Coils of steam pipe heat the oil in the lower tank. A drain is provided to get rid of water which may accumulate in the lower oil tank. Each tank is equipped with a vertical rod for measuring the depth of oil.

The details of the oil supply valve are shown by Fig. 6. This is a conical valve at the end of a long rod which extends through a stuffing box in the top sheet. The valve is held to its seat by a brass spring. To open the

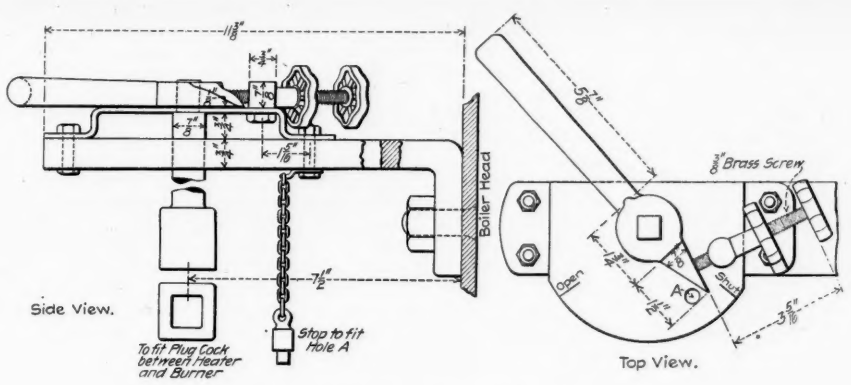


Fig. 4.—Oil Regulator-Rod Handle.

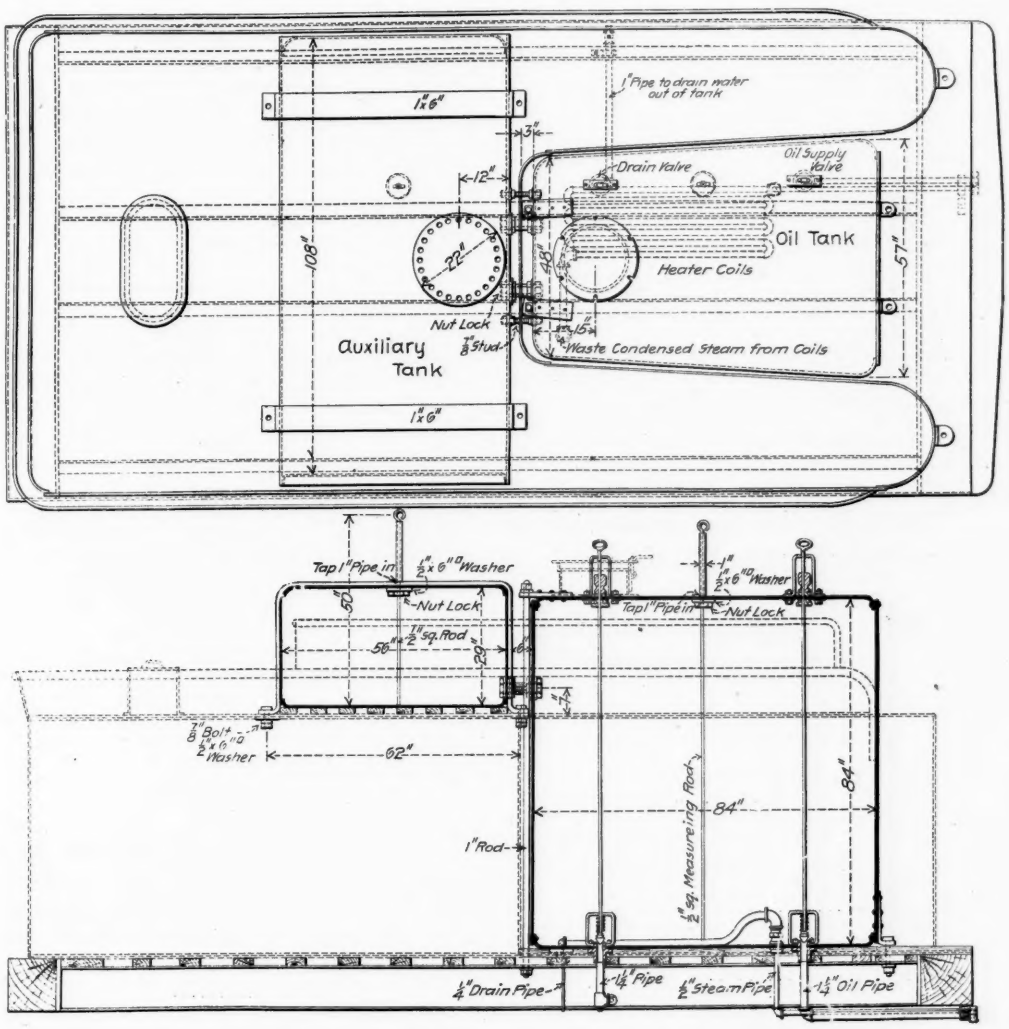


Fig. 5.—General Arrangement of Oil Tanks for Tenders of 4,500 Gals. Capacity.

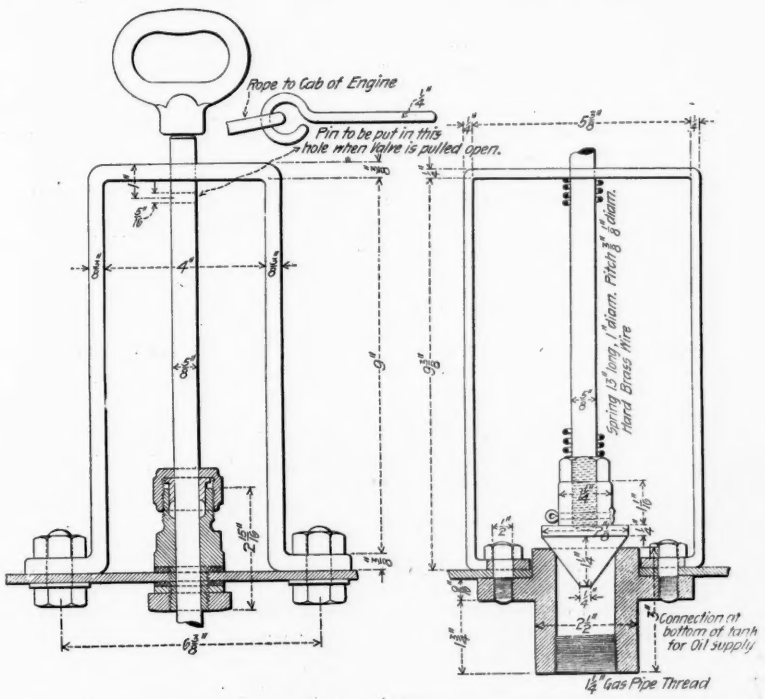

Rope to Cab of Engine
Pin to be put in this hole when Valve is pulled open.
Spring 13" long, 1" diam. Pitch ⅜" of 8" diam. Hard Brass Wire
Connection at bottom of tank for Oil supply
1½" Gas Pipe Thread

Fig. 6.—Details of Oil Supply Valve in Tank.

valve this rod is drawn up and it is held in this position by inserting a pin through the rod. This pin is connected to the engine cab by a cord, so in case the engine and tender should part, the pin is withdrawn; then the action of the spring shuts off the flow of oil from the tank.

By reference to the previous description of the practice of the Gulf, Colorado & Santa Fe it will be seen that in general it conforms quite closely to that of the Southern Pacific, the chief differences being in the design of burners and similar details.

The Bolster Problem.*

In the case of a truck bolster, to design a girder, say 6 ft. 4 in. long between bearings, strong enough to carry one-half the weight of a car, and to withstand the shocks of service, does not seem to be a very complicated or difficult matter. But when account is taken of all the conditions that have to be met, and more particularly of the very limited space that is often available, the problem is much more difficult than the simple statement of it would indicate. . . . Many of the difficulties are due to the fact that the present high capacity car is an evolution from the 15 or 20-ton capacity cars of a comparatively few years ago. While the capacities of the cars have increased 100, or even 150 per cent., the heights of the floor, and of the drawbar, above the rail, have remained practically the same, and this, in a way, has limited the space available for bolsters, in a vertical direction at least. . . . It is a question whether or not in some cases, too much weight has not been given the consideration of maintaining standards, especially when these were developed on cars of very small capacity. Is it not possible that instead of reducing the cost of repairs, it has increased it by imposing difficult conditions, and by using parts for the larger cars that were really too small and too weak, simply to avoid making a new pattern or a new former? . . .

With the idea of determining the approximate ratio between the successful and unsuccessful attempts to solve the bolster problem, and, if possible, to get at the reason for some of the failures, the writer made an examination of about 1,000 loaded cars of all sorts and conditions. An effort was made to examine the cars from as many different roads as possible, and to take only cars which had been built within the last three or four years. No 40,000-lb. capacity cars were taken, and all cars where the result seemed doubtful were left out. An effort was also made to get as many different kinds of cars as possible, so that, while the number examined is small, compared with the total number in service, the results might be considered as representing a fair average of existing conditions. It is assumed that it was the original intention in every case, that the bolster should be strong enough and stiff enough to carry the car free of its side bearings, and this is the basis used to determine the success or failure of the design. Of course, bolsters had failed in other ways, but these will be taken up a little later.

Of the 1,000 cars, 60 per cent. were equipped with some one of the several forms of what we call (for want of a better name) "old style" bolsters, and the balance with some one of the several designs of steel bolsters now on the market. Of the cars equipped with the old style bolsters, 91 per cent. were riding hard on the side bearings. Of the new style, 28 per cent. were down. . . .

Take the case of a 30-ton car, where the available depth for a body bolster is 7 in., and it is required that the draft timbers should pass through it. While the depth is too small to provide necessary stiffness, the condition would not be so bad if it were not required to pass the draft timbers through. This arrangement required the web of the bolster to be cut away at the point where it is most needed, and there are left only two comparatively thin plates—unsupported for a length of about 18 in. to carry one-half of the entire weight of the car. If the top and bottom plates were acting as members of a truss, they could probably be made strong enough; but considering simply the unsupported and parallel portions of these plates, which are usually 15 to 18 in. long, it is perhaps unnecessary to say that there is no truss action here whatever, and that the total strength of the bolster at this point is represented by the combined resistances of the top and bottom plates to cross bending. In this case the bending moment at the center of these plates is about 130,000 in.-lbs., and the strains at the center would be over 50,000 lbs. per sq. in. from cross bending alone. Long before the strain has reached this point, however, the plates have deflected, and the further strain is relieved by the cars coming to rest on the side bearings. We do not hesitate to say, that under the conditions imposed, in a case like this, it is a practical impossibility to design a bolster that will, for any length of time, carry the car free of its side bearings. To safely carry the load in this case, and allowing a working strain of 14,000 lbs. per sq. in., would require a bottom plate of 12 x 2½ in. cross section; but a plate of this size alone, 9 ft. long, would weigh 900 lbs., and the total weight of a bolster, with such a plate, would probably be 1,200 to 1,500 lbs. The difficulty and expense of manufacturing such a bolster is evident.

Now as passing the draft timbers through the bolster is considered by many an absolutely essential condition,

*Extracts from a paper presented before the January meeting of the Western Railway Club, by Mr. R. P. Lamont, Vice-President of the Simplex Railway Appliance Co.

it is still possible to meet it and get the necessary strength, if concessions can be made in other directions; for instance, in the car which we have been discussing, the depth available for the truck bolster was 16 in., or more than double that allowed for the body bolster. Now it can easily be shown that in the usual case, where the length of the body bolster is about 9 ft. and the length of a truck bolster between supports is 6 ft. 4 in., and assuming, also, that the load on the body bolster is evenly distributed, while that of the truck bolster is concentrated at the center, the ratio of the bending moment of the body bolster to that of the truck bolster is about 3 to 4. With a total available space for both bolsters (leaving out center plates) of 23 in. it would be better, if possible, to make the truck bolster 13 in. deep, and the body bolster 10 in. deep. With a body bolster of this depth, and if it were satisfactory to reduce the size of the draft timbers to 6 or 7 in. in depth, where they pass through the bolster, there would be 3 or 4 in. available to carry the web member, or filler of the bolster, through below the draft timber, and in this way get sufficient strength and stiffness.

We found a large number of 30-ton cars with the usual form of "plate" body bolster arranged for long draft timbers, and made with an 8 x ⅞-in. plate for the top member, and an 8 x 1-in. plate for the bottom. How unreasonable it is to expect bolsters made in this way, to carry the weight of the car, can easily be seen without making a theoretical calculation. . . . There are cars being built to-day where the conditions are even worse than the above. We have in mind some 30-ton cars on a very large system, where the body bolster is made up of 7 x ⅞-in., and 7 x 1-in. plates, and with a depth at the center of only 6 in. In this case, the total available depth at the center for both truck and body bolsters is 25 in. and there would seem to be no good reason for not making a more reasonable division of the space between the two bolsters—except, of course, the objection to changing standards.

One other style that is still frequently seen is the so-called sandwich bolster. We found a good many body bolsters of this class on comparatively new cars—used in connection with steel trucks. These were not open to the objection of not having material enough in them. They were made of 4⅞ x 8-in. plates, two pieces of oak 3 x 8 in. and one piece 3¾ x 8 in. The total weight of the bolster, including center plates and side bearings, could not be less than 1,200 lbs. Yet in spite of this great weight they did not seem to be strong enough, for we found only one that was carrying the car off of its side bearing. A theoretical calculation would show that the oak was strained to about 1,500 lbs. per sq. in., while the steel was strained to 15,000 lbs. under a quiet, vertical load—not counting anything for shocks. The same amount of material, or even much less, distributed to better advantage would no doubt have produced a much stiffer bolster. The difficulty with bolsters of this class is that the several parts probably do not act together.

We have referred so far only to body bolsters and to their strength in what we will call a "vertical" direction. In this direction truck bolsters are usually much the stiffer and stronger of the two. They are usually deeper, and while the strain is greater on account of the fact that the load is concentrated at the center, the length is proportionately less. We are not sure that it has always been true, but we believe now that the greater part of the deflection which results in the car being carried on its side bearings, takes place in the body bolster. By "sighting" along its lower edge one can frequently see a deflection of from ⅜ to ¾ in. But while it may be true that the body bolster is theoretically the weaker of the two, we believe that there are probably more failures among truck bolsters. We have no figures to substantiate this statement, but are led to the belief only from the fact that a good many railroads, while adopting some of the new steel truck bolsters, have continued to use their old style body bolster, and we have made the statement with the idea of developing the facts during the discussion. If it is true that the truck bolsters fail more often and are the source of greater expense for repairs, we believe it is largely due to the very severe strains to which they are subjected in what we will call a transverse direction—i.e., in a direction at right angles to the length of the bolster and parallel to the length of the car. It is certainly true that some of the earlier forms of bolsters, in which these strains were apparently overlooked, failed very promptly and rapidly and are practically all out of service at this time.

We have never seen any attempt at a theoretical determination of these transverse strains and it is perhaps useless to speculate on such a changeable and indefinite quantity which may vary all the way from zero, where cars are moving smoothly along on a level track, to practical infinity when they come together with the resistless force of a collision. It may be interesting, however, to see where a theoretical calculation, based on certain assumptions, leads us.

Imagine, if you please, a 40-ton car loaded to its full capacity and moving by itself along a smooth, straight, level track with a speed of 40 miles an hour. Imagine also that the car contains within itself a complete air-brake apparatus. Now, assume that the brakes are applied and that the car is brought to rest by the time it has traveled 1,000 ft. If the weight of the body of the car and its load is, say, 110,000 lbs., its kinetic energy at the above speed is, of course, one-half the mass multiplied by the square of the velocity—or 188,831,500 ft. lbs., and it will require an average force of 188,831 lbs., acting through the space of 1,000 ft. to bring this mass to rest—neglecting like resistance of the air and friction. Now, when the retarding force is applied to the wheels, the body of the car naturally tends to shoot forward, but this is prevented by the resistance of the truck bolster to cross bending. Assuming that each bolster does its share of the work, it is strained in a transverse direction by a force of at least 94,000 lbs. acting at its center. A 12 x 12-in. timber 6 ft. 4 in. long between supports and with a center load of 94,000 lbs. would be strained to 6,000 lbs. per sq. in. Assume, again, that this car is moving with a speed of only five miles per hour and is brought to a sudden stop by coming in contact with a bumping post or with another car. In this case the retarding force is applied to the body and the trucks tend to move forward. If the car is brought to a complete stop in, say, 18 in., this again would imply a strain in a transverse direction in each truck bolster, due to a force of at least 90,000 lbs., applied at the center. . . . It has been suggested a number of times that it might be better to give up trying to carry the load entirely at the center, and to deliberately design the bolsters with the idea of carrying a portion of the load on the side bearings. We are at a loss to see how anything could be gained by so doing. In the first place, we believe the large number of bolsters that are carrying the cars at the center plates, and otherwise meeting the required conditions, shows that a successful solution of the problem is possible. Then even if the bolsters were designed with the idea of carrying the load at three points it would be impossible to determine how much was being carried at each, and it would be unsafe designing not to provide for the worst condition, which is that of carrying the entire load at the center. In some of the bolsters now being made the material is already as thin as it can successfully be handled. In others the steel is so thin that it does not seem possible that it can for many years stand the deteriorating action of the drippings from coal, ore and other substances, and retain the necessary strength. If bolsters were made any lighter than they are, they would be less able to withstand the shocks received in handling, which certainly are not becoming any less severe, and the cost of repairs would be greater.

After all of the strains have been determined, or approximated at least, and all of the other conditions have been taken into account, the question naturally arises as to what is a safe working strain to be allowed in designing a bolster. . . . We believe the question can be satisfactorily answered only by experience. From our present knowledge of the subject we believe that if the quiet load stresses are determined and 50 per cent. added to these, and if the sections are then proportioned on the basis of an allowed strain of 15,000 lbs. per sq. in. in tension, the result will be satisfactory. . . .

The Isthmian Canal

On the editorial pages we have told the fact that the Isthmian Canal Commission has, in a supplementary report, recommended the Panama route. Below are a few extracts from the report, reciting facts that ought by this time to be pretty well known. The total value of the property is found to be:

Excavation done	$27,474,033
Panama Railroad stock at par	6,886,300
Maps, drawings and records	2,000,000
Total	$36,360,333
To which add 10 per cent. to cover commissions	3,639,667
Total	$40,000,000

The last item being intended to cover any buildings, machinery, railroad shares, additional excavation to date of purchase and other assets which may be of value to the United States and have not been included in other items.

In reciting its conclusions in the report dated Nov. 16, 1901, this Commission stated that the selection of the most feasible and practicable route must be made between the Nicaragua and Panama locations adopting its plan of canal with locks in each case. It concluded that the water supply features were satisfactory in both lines; that both dams by which the summit levels would be sustained were practicable, the advantage being in favor of the Conchuda dam in Nicaragua; that the plan of regulating the summit level was practicable in each case, though less simple on the Nicaraguan route than on the Panama; that the present means of transportation were inadequate on the Nicaragua route; while a well-equipped railroad was in operation the entire length of the Panama route; there are now no natural harbors at Nicaragua, while serviceable ones exist at both ends of the Panama route, and although with the completion of the harbors, as planned, one route would have little advantage over the other, the balance was probably in favor of Panama; that owing to the absence of harbors and railroad the period of preparation at Nicaragua would be twice that at Panama.

It was also the sense of the Commission that the total time required for construction of the canal by the Panama route would be 10 years and eight years by the Nicaragua route, with a greater probability of exigencies causing delays on the latter than on the former.

The estimated cost of constructing the Nicaragua canal is $45,430,704 more than the cost of completing the Panama canal.

The estimated annual cost of maintenance and operation is $1,300,000 greater at Nicaragua than at Panama.

The Panama route would be 134.67 miles shorter than the Nicaragua route from sea to sea, with fewer locks and less curvature, both in degrees and miles. The estimated time for a deep-draught vessel to pass through the Nicaragua canal was placed at 33 hours, as against 12 hours for Panama, these estimates being the time of actual navigation and not including delays for winds, currents or darkness.

If the passage were made without interruption, about a day could be saved by the Nicaragua over the Panama route by ordinary steamers handling commerce between our Pacific ports and all Atlantic ports, and about two days by steamers of the same class trading between our Gulf ports and north Pacific ports. The time advantage for the Nicaragua route would be less in the case of fast high-power steamers, the use of which is increasing.

Between Atlantic ports and the west coast of Africa the Panama route has the advantage of about two days, and between Gulf ports and the west coast of South America the Panama route has the advantage of about one day. The trade of the western coast of South America is a very important one, which has hitherto been in European hands.

Foreign Railroad Notes.

The Prussian State Railroads are (Dec. 1) about to give out contracts for no less than 724 new passenger and baggage cars, which will cost altogether about $2,500,000.

The Austrian State Railroads have adopted a standard coal car of 20 kilometric tons, 44,092 lbs. capacity; heretofore the standard coal car carried 15 tons. These, it will be remembered, are four-wheel cars.

Notwithstanding the decline in industrial activity in Germany the coal production is not much less than last year. The three chief coal regions in the month of October shipped out 7,748,660 tons this year, which is but 2.8 per cent. less than last year. For the 10 months ending with October the shipments were 1 per cent. smaller than last year.

The European time-table convention (to settle the international time-tables for next summer) was held in Berlin, Dec. 11 and 12, with delegates from 168 railroad managements in the following countries: Belgium, Bulgaria, Denmark, Germany, France, Great Britain, Italy, Luxemburg, Holland, Norway, Austria, Russia, Roumania, Sweden, Switzerland, Servia, Turkey and Hungary.

New Consolidation Locomotives for the Pennsylvania.

The latest consolidation locomotives built by the Baldwin Locomotive Works for the Pennsylvania Railroad weigh 188,500 lbs., with 168,040 lbs. on the driving wheels, have 22 x 28-in. cylinders, 56-in. driving wheels and fire-boxes 8 ft. 11 5/16 in. long x 5 ft. 6 in. wide. The boilers are of the Belpaire type with 166.5 sq. ft. of fire-box heating surface and 2,677 sq. ft. of tube heating surface, making a total of 2,843.5 sq. ft. The grate area is 49.11 sq. ft. The center of boiler is 9 ft. 2 in. above the rail. The tenders loaded weigh about 120,000 lbs. and have a capacity for 6,000 gals. of water and 10 tons of coal. Other principal dimensions are as follows:

Kind of fuel to be used	Soft coal
Wheel base, total, of engine	24 ft. 9 in.
Wheel base, driving	16 ft. 6½ in.
Wheel base (total engine and tender)	55 ft. 2¾ in.
Height of stack	15 ft. 0 in.
Drivers material of centers	Cast steel
Truck wheels, diameter	30 in.
Journals, driving axle, size	9 x 13 in.
Journals, truck axle, size	5 x 9 in.
Main crank pin, size	6 x 7 in.
Kind of piston rod packing	U. S. Metallic
Main rod, length center to center	10 ft. 7¾ in.
Steam ports, length	21 in.
Steam ports, width	1½ in.
Exhaust ports, length	21 in.
Exhaust ports, width	3 in.
Bridge, width	1¼ in.
Valves, kind of	Richardson Balanced
Valves, greatest travel	6 in.
Valves, outside lap	1 in.
Valves, inside lap	Front, ⅛ in.; back, 0 in.
Valves	Variable
Boiler, working steam pressure	185 lbs.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	¾ in.
Boiler, diameter of barrel	71 in.
Seams, kind of horizontal	Quadruple riveted
Seams, kind of circumferential	Double riveted
Thickness of tube sheets	½ in.
Thickness of crown sheet	⅝ in.
Crown sheet stayed with	Vertical stays
Dome, diameter	29 in.
Fire-box, depth front	75 3/16 in.
Fire-box, depth back	61 3/16 in.
Fire-box, material	Steel
Fire-box, thickness of sheets	5/16 in.
Fire-box, brick arch?	No
Fire-box, water space, width	Front, 5 in.; sides, 5 in.; back, 5 in.
Grate, kind of	P. R. R. style
Tubes, number	373
Tubes, material	Iron
Tubes, outside diameter	2 in.
Tubes, length over sheets	13 ft. 9¼ in.
Smoke-box, diameter	74 in.
Smoke-box, length	5 ft. 6½ in.
Exhaust nozzle	Single
Exhaust nozzle	Permanent
Netting, wire or plate	Wire netting
Netting, size of mesh	2½ x 2½ per in.
Stack	Straight
Stack, diameter	17 in.

Tender.

Material in tank	Steel
Thickness of tank sheets	¼ in. and 5/16 in.
Under-frame	Wood
Type of truck	Arch bar, rigid
Truck bolster	Schoen pressed steel
Length of tank	23 ft. 9 in.
Back draw-head	Janney coupler

With water scoop.

A New Radial Drill.

The Bickford Drill & Tool Company, of Cincinnati, Ohio, have just put on the market a new radial drill, illustrated in Fig. 1. It has many novel features, and promises increased output and great accuracy.

There is a wide range of speeds and feeds operated quickly through nests of gears without stopping the spindle; a depth gauge for reading all depths from zero; a multiple automatic trip that can be set to operate at as many different depths as there are holes to be drilled; an absolute safety stop; and a tapping device that operates at all speeds. All the adjusting levers are within easy reach of the operator.

The power is applied to a single driving pulley and is transmitted through a speed box mounted on the base at the left of the column. The single lever shown controls four speeds without stopping any part of the machine. The friction clutches are shown in the sectional view, Fig. 2.

The speed box takes the place of the customary cone pulley. It does away with all belt shifting, prolongs the life of the belt, and gives great economy of power. The belt speed is constant and the pull, therefore, directly proportional to the power absorbed at the drill. It can be driven from below the floor and the arm is free to describe a full circle about the column. It permits setting the machine at right angles to the line shafting by using a quarter twist belt, and is equally efficient when driven electrically by direct connection of a constant speed motor.

The second shaft of the speed box transmits through miters to the back gears, which are operated through friction clutches, by the pair of levers shown at the extreme left of the arm. An engraved index plate on the cuff tells the operator how to manipulate these levers. The speed box and back gears together give 16 spindle speeds, from 16 to 256 r.p.m. The back gear shaft transmits to the head and through a simple train of gears to the drill spindle.

The feedbox contains a nest of gears that give instantly any one of eight feeds, ranging from .005 in. to .1 in. per revolution of spindle.

The method of changing feed is shown in Fig. 3. The sliding key A is hinged to the pull-pin B; there are three keyways in each gear and between each pair of adjacent gears there is a steel ring so shaped that the key is free to be moved to any one of the four gears and then engages automatically with the first of the three keyways that comes around.

It will be seen that the position of lever C, a quarter turn of which changes the feed either to the next higher or the next lower, indicates which of the gears is operating. The cone of gears shown gives four of the eight feeds, and the other four are obtained by means of a similar pull-pin key, actuating two gears immediately below. The engraved plate on the front of the speed box gives position of levers for the eight feeds. The range of these feeds is indicated in Fig. 4. The specimen shown was prepared without stopping the spindle, each ½ in. of traverse being read direct on the dial depth gage.

One of the most novel features of the machine is the zero depth gage and multiple automatic trip. In the lower view Fig. 5 shows this trip and gage set for drilling three holes, the respective depths of which are 3, 6½ and 8¾ in. To set, the graduated dial is turned until its stop pin brings its zero opposite the fixed pointer. The dogs are then set by the graduations on the dial for the depths required. An important feature of this tripping mechanism is that while drilling the 8¾-in. hole, for which the third dog is set, the other dogs can be rendered inoperative by lifting a latch on the clutch pawl; or if the workman neglects to lift the latch and so permits an intermediate dog to trip, the feed can be continued without interruption by throwing the clutch in again by hand. The upper view of Fig. 5 shows the first dog at the moment of tripping.

The safety stop, S, Fig. 5, is a steel pin permanently secured in the face of the tripping gear. When the spindle reaches the end of its traverse this pin engages positively with the fixed part of the clutch pawl and makes it impossible for the feed to be continued or the clutch thrown in again until the spindle has been raised. The arm and the column of the machine are of pipe section to overcome the twisting and bending stresses, while to take care of exceptionally severe conditions the base has a circular arc slot from which the end of the arm can be supported. It will be noticed that the hand wheel for operating the head is on the head itself immediately in front of the tapping lever.

The machine is being built in four styles with modifications of some of the above features, and in three sizes, to drill to the centers of 8-ft., 10-ft. and 12-ft. circles. The illustration shows the smallest size, having a total vertical feed of 15 in. and the makers say it will pull a 4-in. twist drill through solid cast-iron under a feed of .012 in. per revolution.

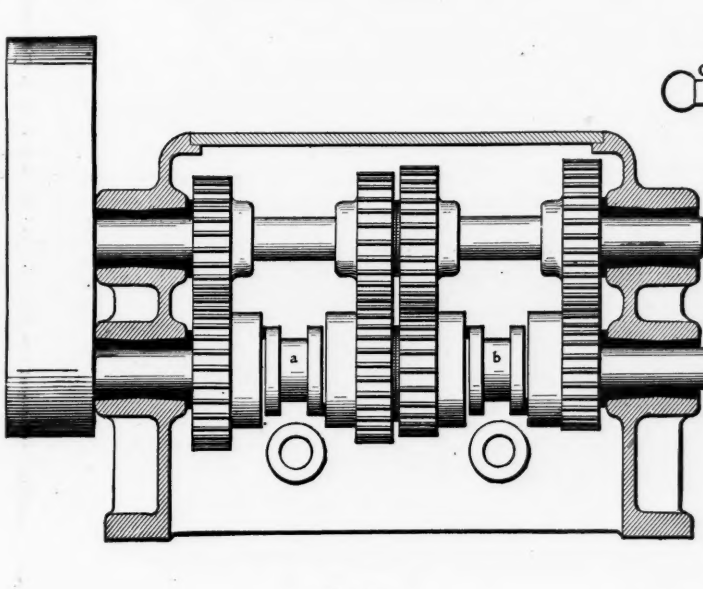


Fig. 2.

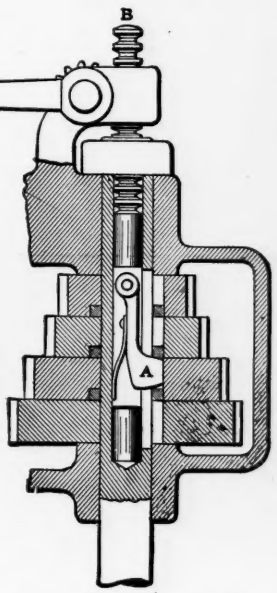


Fig. 3.

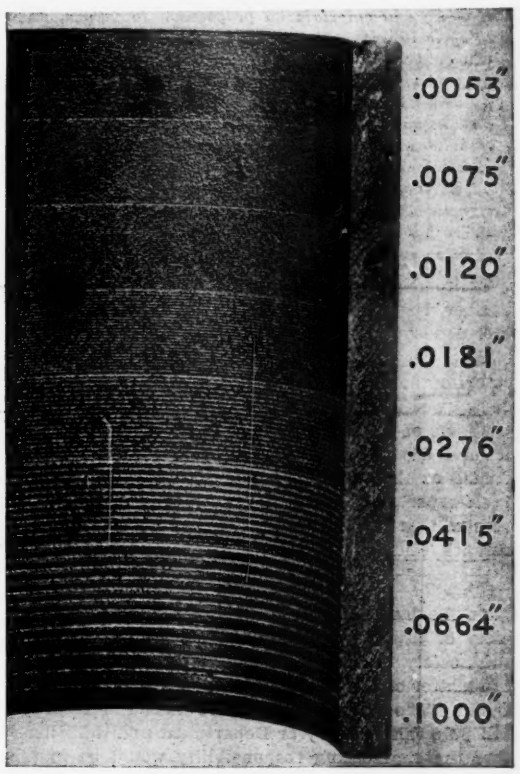


Fig. 4.

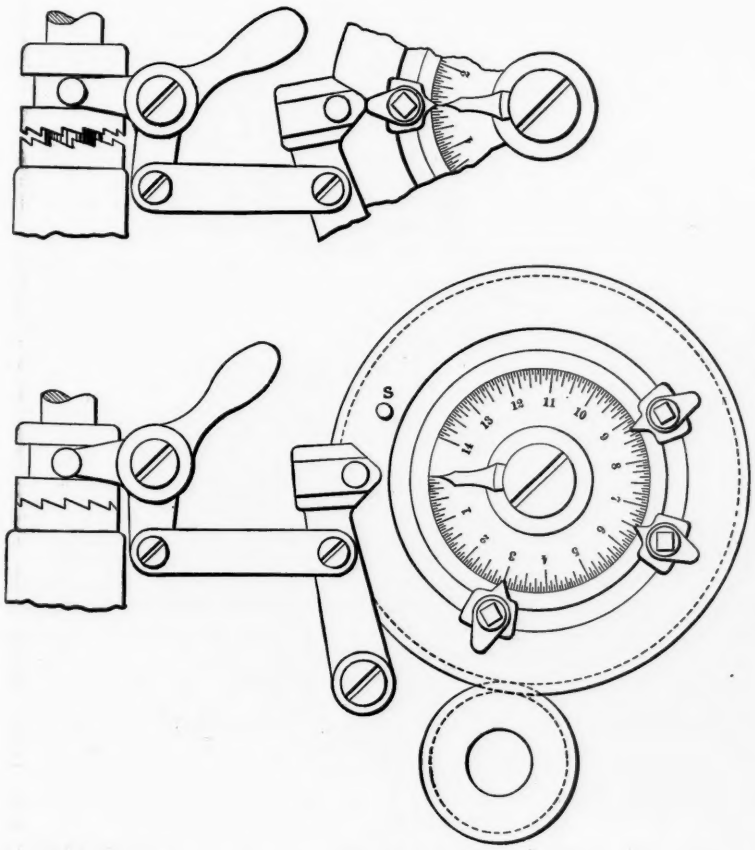


Fig. 5.

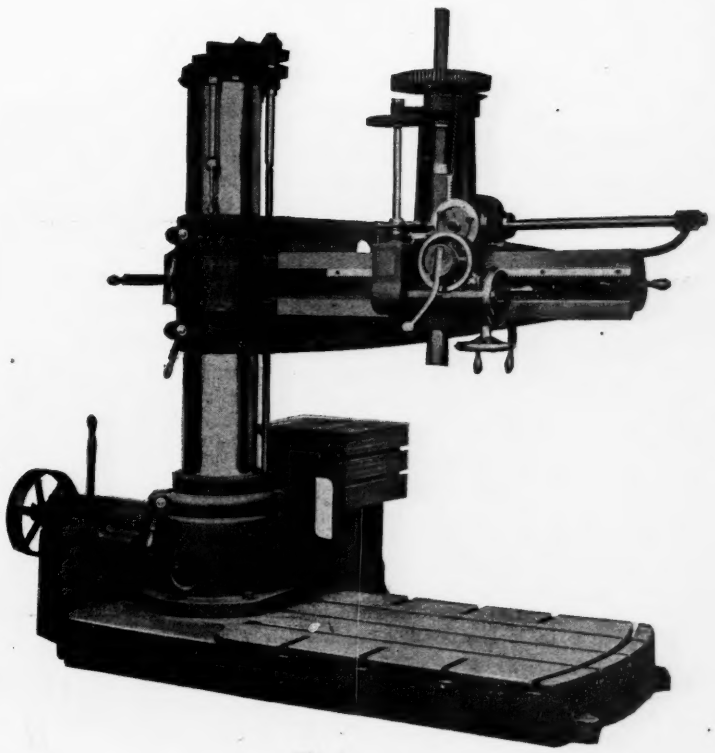


Fig. 1.

The New Bickford Radial Drill.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Railroad gross earnings fell off somewhat in December, but they remained pretty comfortable. The increase over the year before (for the month) was 5.05 per cent., according to the statistics of 104 roads compiled by the *Chronicle*. There was a great deal of bad weather during the month, and serious floods. On some of the big roads hardly a wheel was turned for five days, so that the failure to continue the increase at the rate of preceding months must have been expected. So far as we can observe the progress will go on again in Jaunary as before the slight setback of December.

At the last annual meeting of the American Society of Civil Engineers an effort was made to get the Society to take some action before Congress in the matter of the engineering charge of the Isthmian Canal. The points raised were that the Hepburn bill puts this in the War Department and that therefore the engineering responsibility would be in the Engineer Bureau of the War Department; and that this greatest engineering work of the twentieth century should be open to the best ability of the whole profession. The matter was introduced before the Society by excellent and highly respectable authority, but it was voted down decidedly and, as we judge, properly. If the vote on that occasion is a fair indication of the feeling of the Society at large it will never, as a society, go before Congress, asking for professional recognition. In truth, the American Society of Civil Engineers has never asked for anything for itself or for its members, and probably it never will. The position of the profession and of the Society is not to be established by claiming recognition in the press or before Congress. If the work of engineers and their character as individuals, as indicated by their service to civilization and their weight in their respective communities has not fixed their place in the public estimation, delegations to Congress and protestations in the public press will not help matters, and will surely be misunderstood. To be sure, it may be suggested that if you want anything you must ask for it; but we may safely leave this to the experience and the feeling of every professional man who has reached a position of any dignity. We venture the proposition that he will say that almost every professional recognition which has come to him has come without asking; and we venture to say further that the mere thought of asking would be repugnant to his feelings of personal and professional dignity. Of course, a man must at the outset make known his existence in some way, but the American Society of Civil Engineers is under no such necessity. To pass from the general to the specific, we question if there is any reason for anxiety in this matter of the engineering of the Isthmian Canal. The Hepburn (House) bill provides that the canal should be built by the Secretary of War. The Perkins (Senate) bill provides that it should be built by a civil commission. Fortunately neither one of those bills is likely to become a law, as it stands, for it would be hard to decide which one of them is worst. The Perkins bill provides for the appointment of a board of five commissioners who shall devote their whole time to this work, and who shall receive $10,000 a year each. It provides for one chief engineer who shall receive $10,000 and one assistant to the chief who shall receive $5,000 a year. That is, for the high control and organization we shall spend $50,000 a year for commissioners and $15,000 for engineers. It seems like a good deal of sack for so little bread. It is not likely that either bill will become a law, and it is most unlikely that any law will be passed which will compel the Engineer Bureau to take the chief engineering charge of the work. There is still a good deal of common sense left in Congress. But engineers of standing ought to explain matters personally and privately to members of Congress.

For years past it has been our custom to record in the last issue of one year, or the first issue of the next, the number of locomotives built by the contracting works in the United States between Jan. 1 and Dec. 31. We are now able to give the figures for 1901 in usual detail excepting the output of compounds, on which we shall comment later. The delay was unavoidable and we preferred to await official figures rather than attempt to estimate. The total output of the eight locomotive building companies (representing 15 plants) for the year 1901 was 3,384. This is 231, or 7.3 per cent. more than in 1900, and is the largest output for any one year since building locomotives began. It is especially interesting because the two previous years also were record-breakers and the new record was made with one works closed for some six months undergoing reorganization. The following table gives the output of the contracting locomotive works for the past 10 years:

1901	3,384	1895	1,101
1900	3,153	1894	695
1899	2,473	1893	2,011
1898	1,875	1892	2,012
1897	1,251	1891	2,165
1896	1,175	1890	2,240

Of course, it is understood that the locomotives built at the railroad shops are not included here. The figures for 1901 include 170 geared, 45 electric and 44 compressed air locomotives and some 300 locomotives for light service, such as mine or plantation work, or contractors' use. Of the 3,384 locomotives built last year, 337, or not quite 10 per cent., were for export. In 1900 the number built for use outside the United States was 505, or about 16 per cent. of the total output. The decrease is due in some degree to the demand for locomotives for home use. Unless present conditions change materially in a very short time (and this does not now seem probable) the figures for 1902 will show a still further decrease in export. Most of the locomotive works have on their books orders, or their equivalent, that will keep them busy for the next nine months, and but few call for engines to be sent abroad. For comparison, the following will show the number exported each year for the last six years:

1896.	1897.	1898.	1899.	1900.	1901.
309	386	554	514	505	337

The Isthmian Canal.

The Isthmian Canal Commission on Jan. 18 sent to the President a supplementary report on the matter of the best route for an Isthmian Canal. The conclusion of that report is:

"After considering the changed conditions that now exist and all the facts and circumstances upon which its present judgment must be based, the commission is of the opinion that 'the most practicable and feasible route' for an Isthmian canal, to be 'under the control, management and ownership of the United States,' is that known as the Panama route."

Only a few weeks ago the same Commissioners presented a report which ended with almost the same words with the very vital exception that the next to the last word was "Nicaragua" instead of "Panama." A certain foolish editor is reported to have said in his newspaper that the Commissioners have "befogged the issue," and a certain foolish Senator has said that the New Panama Canal Company cannot transfer its property; that, in fact, the very act of trying to make such transfer invalidates its concessions. Of course, there is no excuse for either the editor or the Senator. No man who can read the English language need fall into such errors.

It is true that the Commissioners in their report recommended the Nicaragua canal; but they stated with great care the reasons, and it was obvious to anybody who took pains to read the report that the matter turned on the willingness of the New Panama Canal Company to sell out at a reasonable price. It was obvious that the sum of the advantages was considerably on the side of Panama, but the Commissioners decided that we ought not to pay more than 40 million dollars for these superior advantages. Concerning the wisdom of fixing the price at 40 million dollars instead of 30 million dollars or 50 million dollars, it would be impertinent to express an opinion. The gentlemen who made the report had all the facts before them, and they are accustomed to great responsibilities and to dealing with large enterprises. We are willing to accept their judgment in the matter of price.

We so recently went over this whole matter (Jan. 3, page 8) that it is not worth while to add anything new in the way of analysis or argument. It is quite true that in the concessions from the Colombian government the Canal Company is forbidden to concede or mortgage its rights, under any consideration whatever, to any nation or foreign government under penalty of forfeiture. And in the matter of the contract with the railroad company the Canal Company forfeits its rights by the mere act of attempting the transfer of its privileges to a foreign government. That, of course, is what the Senator had in mind, but he must have known, or, at any rate, ought to have known, that the Colombian government had waived these prohibitions and had explicitly authorized the company to treat directly with the United States.

The strange conduct of the representatives of the New Panama Canal Company made it impracticable for us to attempt further negotiation, and therefore the Commission was obliged to recommend the Nicaragua route. Then the Panama Company came to their senses and saw the danger of their situation. They saw that the people of the United States were in no mood to trifle with, and that there was great probability that the Nicaragua route would be settled upon by legislation this winter. They appreciated, no doubt, that this very act would destroy such value as remained in the Panama rights, privileges and physical property. The result has been what all the world now knows; and the situation was changed by the willingness of the Panama people to accept the price named by the Commission.

We must not conclude, however, that now we are out of the woods. The offer now made by the New Panama Canal Company is to hold good until March 4, 1903, and meantime we shall have to settle matters with the Colombian government, for naturally there must be a new treaty and concession. But the same situation exists on the Nicaragua route. The decision of our government to build a canal on that route would not settle the matter; we should still have to make an agreement with two other governments, namely, Nicaragua and Costa Rica. Furthermore, we should have to get possession of land along the Nicaragua route now held by private parties; and there are cynical people who seem to think that the Nicaragua government has recently arranged for the ownership of large tracts by individuals. At Panama, fortunately, the company can convey to us the title to about 30,000 acres of land which, with the lands belonging to the railroad company, covers nearly all of the ground required for the actual building of the canal. So far as this matter goes then the situation would seem to be simpler at Panama than at Nicaragua.

A few paragraphs from the supplementary report appear on another page.

Rolling Rails at Low Temperature.

The reader who is interested in the metallurgy of rail steel will not fail to have noticed an important article which appeared in our issue of Jan. 3. It was by Mr. S. S. Martin, superintendent of the steel department of the Maryland Steel Company. It is now ten months since we published certain microphotographs showing steel made at the Edgar-Thomson works by the new process of holding the rails to cool before finishing, and showing also steel made at Sparrow's Point by the usual process there, viz., direct rolling and no delay before the finish. So far as those examples went there was not much to choose, and obviously there is a certain conflict of interests involved. Now Mr. Martin's paper comes as a useful contribution to this very interesting subject, and the competent reader will discover that it is calculated to again raise a question as to the utility of holding the rails before the final passes, and that it is intended also to show that a better result is got from direct rolling than can be got by reheating. Now we shall sum up the principal points of the

paper, concerning which we shall have more or less to say:

(1) Mr. Martin brings out the fact that a high finishing temperature produces a coarse granular structure and that rails of such structure give poor wear in service. This, we suppose, is now admitted by all engineers who are well enough informed to be entrusted with the care of rails; but it is so fundamental that it must be constantly restated in the discussions of the subject.

(2) In light rails finished at low temperature is found a non-granular structure which gives much better wear in service. This is a definite statement from the standpoint of the manufacturer of a fact that has been observed and talked about for some years in the columns of this journal and by engineers and specialists. Mr. Martin says "the latter [meaning the railroads] have never developed the reason for it." Probably this is true if we mean by "develop" the proper consideration of all the elements of work put on the metal, of temperature during the last period of work, and of carbon content. Mr. Martin shows the results of work and temperature as bearing on the reduction of the mass of metal to small sections, and also as affecting the question of reheating or direct rolling.

(3) Mr. Martin says that a coarse granular structure is much more likely to be produced in rails rolled from reheated blooms than in those rolled direct from the ingot. This point is sustained by the micro-photographs reproduced.

(4) It is claimed that the same finishing temperature of rails rolled from reheated blooms will give a more granular structure than those rolled from the ingot, and that, therefore, the amount of shrinkage would not be a check on the internal structure of the finished rail. The micro-photographs testify that Mr. Martin is correct in the first part of this statement. If this is so it means that less shrinkage must be specified as a maximum limit for rails rolled from reheated blooms than for rails rolled direct from the ingot, to get the same result in the finished rail. Of course the exact amount of shrinkage for rails rolled by either process must still be determined.

(5) Mr. Martin objects to the shrinkage clause in specifications as a check on the finishing temperature and suggests a microscopical examination as a substitute. Probably we risk nothing in saying that Mr. Martin, together with every other rail maker, would immediately rise up against any such requirements. It would seriously delay the mills, and, further, not enough is yet known of the micro-structure of rails to make it practicable to work to such a test. There is a great difference of micro-structure due to the chemical composition and there are very few men living, if any, who could justly apply such a test to the finished structure.

(6) We are told in the paper under consideration that the shrinkage in steel will differ with different chemical compositions. This is very interesting. Is it theory or is it practical observation? If it is a matter of practical observation what is the greatest difference in shrinkage observed in rails of different chemical compositions when these rails have been rolled at the same finishing temperature accurately determined?

If the microscopical observation cannot be made the ultimate test of acceptance we are left to

(A) accepting rails rolled at any temperature, without any check on the finishing temperature, and without a drop test as a check on physical properties, or

(B) taking the rails rolled as above, but making drop tests to check the physical properties, or

(C) limiting the amount of shrinkage of a 30-ft. rail to some definite figure, thus insuring a practically uniform temperature; and, further, making drop tests on the finished rails.

No doubt, everybody will admit that the user buying rails under condition (A) will take more chances of getting inferior rails with coarse, granular structure than any competent engineer would advise. The first test of the rails under this method of buying would be in the track.

(B) This method would be much better than (A) provided a drop test is made on each heat of steel; but this is not often required in specifications, although some mills consider it so important that they make their own drop test from each heat.

(C), the third method, which only differs from (B) by the addition of the shrinkage clause, is probably the best practical method that has ever been suggested and put in use. It checks the brittleness and toughness of the rails and it insures finish in rolling at a practically uniform temperature, and reduces to a minimum the danger of the coarse granular structure.

An engineer of an important road, when asked recently how he checked the finishing temperature of rails, replied, "by the drop test on finished rails," and he added that from a very large number of recent drop tests made on rails of the same chemical composition, some finished at a high temperature and others at a low temperature, the former broke under test, while the latter did not break, and were very tough. He thinks the rails he is now getting are much more satisfactory than former rails which were accepted without making any tests whatever.

We find, further, that one of the biggest roads has embodied the shrinkage clause in its specifications and is enforcing it. This has caused no particular hardship to the mills, and has given rails which are more satisfactory under drop test than those rolled under ordinary conditions. The deflection was found to be greater, and therefore higher carbon was required, as this can be used without brittleness if rails are finished at a low temperature, provided a check is kept of this finishing temperature by limiting the shrinkage; also, by making frequent drop tests.

Naturally we were pleased to learn of these suggestions resulting from practical tests, for it confirms our judgment expressed some months ago in these columns, and in discussion before the American Railway and Maintenance-of-Way Association (Vol. 2, of Proceedings, p. 203), that the good qualities of higher carbon steel could be taken advantage of in heavy rails, provided the finishing temperature was low enough to avoid granular structure being formed. What we have particularly called attention to in the past is the danger of using very high carbon steel in heavy rails, and finishing them at too high a temperature, as by doing so, we are sure to get into trouble with brittle and poor-wearing rails.

The value of a good specification lies in its practicability. Nothing is simpler or easier to use than this shrinkage clause. Rails are now being rolled with one inch less shrinkage (in 30-ft. rails) than one year ago; which means a material decrease in finishing temperature of the rails. Some two years ago Mr. Webster, in an article in this journal, called attention to the importance of controlling the finishing temperature, and advocated the introduction of a shrinkage clause in the specifications as being the simplest and best means of checking it. He also called attention to a difficulty in rolling heavy rails at a low temperature, on account of the thin metal in the flange cooling off too quickly, and said it might be found necessary to increase the metal in the flange in order to carry the heat, and thus allow the head to be finished at the proper temperature; and at the same time he pointed out that the difficulty would increase with the higher carbons. Following up this idea he caused to be brought before the American Society of Civil Engineers a resolution to appoint a committee on rail sections, to consider all of these matters, and, as we stated last week, in the letter ballot over 1,000 members voted for the appointment of the committee, and only about 55 against it. This insures the appointment of the committee, and the Society thus undertakes to carry on the very important work which it began in the late eighties by the appointment of the committee which brought out its famous series of standard rail sections.

Mr. Jerome's Investigation of the Tunnel Collision.

We give in another column the essential parts of the testimony which has been brought out thus far (Wednesday) at the Coroner's inquest on the collision in New York City, Jan. 8. The inquest has attracted a great deal of notice; but the public interest in the subject has been made abnormal by the clumsy way in which the inquiry has been conducted (for a good part of the time), and the still more clumsy way in which some of the questions have been answered.

That District Attorney Jerome is an officer of great ability and high purpose is unquestionable; but he has spent a good deal of time at the inquest in asking irrelevant questions; and some railroad witnesses have by the incompleteness of their answers given wrong impressions on important points, both to the District Attorney and to the public. People have got the idea, from the reports in the newspapers, that trains are constantly run through the tunnel by guess; and that the runners cannot see the signals, and therefore freely take chances, lest they may be censured for not making time. Mr. Jerome proclaimed that enginemen are more severely punished for losing time than they are for overrunning stop signals. This was his interpretation of Mr. Franklin's testimony, and Mr. Franklin seems to have made no protest against it.

Witnesses who were asked if there was not a good deal of grease on the track, the question evidently being designed to elicit information about the possibility of quickly stopping a train, answered with a simple affirmative; when the fact was, no doubt, that the grease did not interfere in the slightest degree with the action of the brakes.

When the District Attorney endeavored to make out that the enginemen have a terrible time in finding the signals, the answers, so far as can be made out from the verbatim reports, constantly encouraged him to believe that his theory was correct. No witness made it clear to him that every engineman who is intelligent enough to realize the value, to himself, of a monitor, can have one at all times, in the person of the fireman.

The fact that distant signals, with very large lights, always giving a thousand feet in which to bring a train to a stop, are encountered by the engineman at intervals of only about three-quarters of a mile, is a fundamental fact which must be kept in mind throughout the investigation; but the public learns nothing of it through the newspapers, except perhaps by minute study, such as editors, reporters and readers are not likely to make.

The District Attorney made a great deal of the testimony that enginemen, when running through fog or smoke, have to "feel" their way; and he made it appear that this process was very much like running an ocean steamer into an unknown harbor in Alaska, or like Dewey's entrance to Manila Bay. Of course, everybody acquainted with engine running knows that the term "feel" as used in railroad parlance, means counting or otherwise identifying the light-openings in the tunnel, or watching for other known landmarks, or merely slackening speed so as to more accurately estimate the distance from the last signal that was passed, or to more surely decide whether a summit or a hollow has been passed. But so far as the newspaper reader is informed, "feeling" means running a mile a minute by guess.

The fact that a flagman goes back a short distance from every delayed train, and a considerable distance when the train stops more than a fraction of a minute, was not emphasized, or even mentioned, so far as we can see; and yet this is really a material safeguard, which should have been mentioned in explanation of the apparent leniency of the officers in dealing with negligent enginemen.

We give these few notes at this time chiefly for the benefit of our readers at a distance, who may be puzzled by the reports which they find in the press despatches and the New York dailies; and who thus may get a very unfair view of the way in which railroading is carried on in New York. To one unacquainted with the situation the conditions in the "tunnel" cannot be described in a brief speech of a lawyer in court, or in any off-hand manner. The "tunnel," so called, is two miles long. It has four tracks. Two short sections are real tunnels, but with frequent openings in the roof. The rest of the way the inner tracks are in an open cut, with vertical walls at the sides. Each of the two outer tracks is in a narrow tunnel all the way, but with openings at the side admitting light from the center cut or tunnel. The grade is irregular, there being two summits. In the side tunnels, at Eighty-sixth street, an accumulation of smoke may frequently compel an engineman to run slowly to find the signal; but the signal which was disregarded on Jan. 8, at Fifty-ninth street, like that which was disregarded eleven years ago at Seventy-second street, is in the open cut, darkened only by the overhead bridges at the street crossings.

When the State railroad commissioners come to investigate the collision (next week) the evidence concerning it will, no doubt, be set forth in more satisfactory shape. We may say that thus far nothing has been brought out which necessitates any change in the conclusions which we published last week.

At a convention of ironmasters and manufacturers of machinery, etc., in Vienna, recently, it was reported that the production of rails in Austria was about the same last year as in 1900; but it is to be remembered that the production declined greatly from 1899 to 1900. There was a considerable decrease in the sales of other railroad materials in 1901, and prices were extraordinarily bad. Bridge-building and other establishments consuming iron had a very unsatisfactory year. Prices fell to a point never before known in Austria, and an improvement of the situation is hardly to be expected until the end of 1902, or till 1903, when rails, bridges, etc., will be required for some important railroads now under construction. The locomotive works were busy last year, but only because of contracts from foreign countries. Car works, on the other hand, were very badly off and as early as July were compelled to reduce hours and dismiss workmen. Their prospects for this year are

very bad. Very few orders come from Austrian railroads, and at recent lettings of foreign contracts German works offered to build cars at prices far below the cost of construction in Austria. The Austrian Railroad Minister has offered to let contracts, not only for 36 locomotives and 20 tenders, being the balance authorized for 1902, but also for the 65 locomotives and 50 tenders authorized for 1903, for which some $1,800,000 has been appropriated. The contracts will be divided among five locomotive works in Austria. It is also reported that he has notified the various car works that they may submit bids for 1,025 cars—passenger, freight and service—for delivery in 1902 and 1903.

Lubrication of Cars.

BY GEORGE P. ZACHRITZ.

The following extracts are from a paper on this subject, presented at the December, 1901, meeting of the North-West Railway Club, by Mr. George P. Zachritz, General Car Inspector of the M., St. P. & S. Ste. Marie. The discussion will, as usual, be deferred until the next month's meeting.

As the idea of lubrication is to prevent the journals from heating, to successfully and economically do this you must see: First, that the journals are in proper condition before being applied; second, that proper metal is in bearings; third, that proper conditions exist as to oil boxes; fourth, that cars are properly loaded; and last, but not least, that a properly prepared lubricant is properly applied.

In the first proposition we meet with conditions that are the hardest to overcome, and they are conditions that cause more trouble than they are given credit for, that is, the proper care is not being given the journals. Especially is this true regarding freight car journals. Journals are put into freight car service that are tapered, some are worn oval-shape, the collars at front end are badly worn, fillets are worn at both ends of journals; and when they are turned up they are either rough with tool marks or have been smoothed with flour of emery and oil, which is bad practice. In fact, it seems to be taken for granted that because freight cars are slow-going, any kind of journal is good enough for them, while the journals intended for passenger service must be as near perfect as machinery can make them. It is true that the passenger trains are run much faster, and I advocate conditions being made as nearly perfect as is possible, but the freight journals carry a heavier load per square inch of bearing surface, and they also often run quite fast, and it is my opinion that it would be economy to have the freight car journals put in the same perfect condition that passenger journals are put in. A journal that is not fit for passenger service is equally unfit for freight service, and the money saved in shop expense by not properly fitting freight journals is more than lost in brass and oil consumption.

We shall consider the second proposition in connection with the journal.

What is the proper metal for journal bearings?

The proper metal to use on any journal is the metal that will carry the load put on it, with the least amount of friction. There being such a diversity of opinion in regard to the relative merits of the different styles and compositions of journal bearings, it would seem as though some of the railroad organizations would put this question in the hands of a committee on tests to determine.

First.—What is the difference in cost between a shell or filled bearing and solid bronze?

Second.—What is the difference in mileage made between the two kinds of bearings?

Third.—What is the difference in oil consumption as between the two kinds of bearings?

In considering the first question, we admit the item of first cost to be in favor of the shell or filled bearing, but in the second it is reasonable to assume that the wearing ability of the solid bronze is much greater than the other, and that a very decidedly increased mileage might be expected from the solid bronze bearing. But will the mileage be sufficiently greater to offset the additional cost? In comparing the cost of the two styles of bearings the cost of changing the one that will make the lesser mileage must be taken into account.

Again, is it not reasonable to assume that the metal that will make the greater mileage will consume the least oil in a given mileage? If this is a fact, the item of oil consumption is in favor of the solid bearing.

Another thing we should consider is whether or not you can economically use the same composition of metal for journal bearings to be used on iron and steel journals. I do not think this question has been given sufficient consideration, and yet it is one with which we have to do every day.

There is a great number of steel axles now in use under passenger cars, and I do not think that any of the roads using them specify that a different composition be used than the one they use on the iron journals. Some years ago my attention was called to certain journal bearings that gave very poor service in passenger cars, and after considerable trouble with hot boxes it was decided that the fault was in the journal bearing, and a new kind of bearing was substituted, with splendid results, but it was found that when a steel axle was applied and the new brasses were used on the steel journals, we had trouble with them. They invariably ran hot. As an experiment I applied some of the bearings that had given the trouble with the iron axles, and found that they would run without heating.

The only authority I have been able to find on this subject is in a paper read before this association at its November meeting in 1893, by Mr. W. C. Dallas, of the Galena Oil Company. On page 5 he says: "The proportion of copper and tin for brasses to be used on iron and steel axles is an important factor, and one not to be lost sight of. Where seven parts of copper to one of tin are necessary for use on iron axles. If the brasses designed for steel axles are put on iron axles they will wear too fast, and in addition they seem to be more sensitive to heat than the six to one." If this is true, it is a mistake to use the same bearings on the two kinds of axles.

In proposition number three, I think I may safely say we find the worst condition of affairs in car construction.

I will ask you to observe some of the foreign cars on your line (to be sure and observe foreign cars) and you will find what increases the cost of lubrication. You will find oil running out of the front end of the oil box to the ground; you will find oil running out of the rear end of the oil box to the wheel; you will find boxes with imperfectly fitting covers, and boxes with no covers at all. You will find in these boxes that the oil—that is, what remains of the oil—is mixed with sand and dust. On examining the rear end of the box, you find no improvement of conditions. The rust guards are found loose, improperly fitted, broken or missing, and the only wonder is that the cars run as well as they do.

Cars cannot be economically lubricated so long as these conditions prevail, and it is only a question of time when the old back-number "oil wasters" will have been discarded and up-to-date dirt excluders and oil-retainers substituted; exclude the dirt and retain the oil—this is the secret of successful lubrication.

The overloading of cars is a source of much annoyance and the cause of a great many hot boxes and consequent increased oil consumption. It is the cause of increased oil consumption in two ways. First, it causes the cars to run hot, which burns the oil out of the boxes, and second, it causes the oiler to use more oil sometimes when it is not needed.

If a 40,000-lb. capacity car is loaded to the 10 per cent. limit and 2,000 lbs. more of the load is in one end of the car than the other, the end that is so overloaded is loaded 20 per cent. over its capacity. While in a majority of cases this would cause no trouble, nevertheless in some instances it would, and the blame would be put on the man who has charge of oiling the cars when he is in no way at fault. I believe that not enough attention is given to the proper loading of cars and that until there is, we will be bothered with hot boxes from this cause, and they cannot be prevented, no matter what the condition of the box, bearing, etc., is nor how much oil is used.

The manner of applying lubricants to cars differs on different lines; some lines still use the oil can in the old way, with what success you can readily imagine; some apply it by saturating cotton or other waste with oil and packing the boxes with this. This appears to have become the general practice, and I believe is economical. Some lines prepare their packing by putting the waste in a vat and pouring over it a quantity of oil and soaking it for a certain time, after which it is drained for a time, and is then ready for use. Others use a vat having a screen a few inches from the bottom, into which the waste oil is put; when the oil filters through the waste into the bottom of the vat it is drawn out and poured over the waste again. I think the latter the best method for preparing packing, especially when old packing is worked over, for when the oil is filtered through the packing it filters out a considerable part of the sand and dirt that may be contained in it. When the packing in the top of the vat gets dry, all that is necessary is to draw off the surplus oil in bottom and pour it over the top. In this way packing can be kept in very good condition with very little labor.

In using prepared packing care should be taken not to use any more of it than is necessary to lubricate the journal. If it is desired to oil a car on account of packing being dry, it is unnecessary to remove all the packing from the box and repack with new packing. Remove some of the packing along the sides of the journal, after which arrange the packing under the journal properly and put some fresh prepared packing along the sides of the journal. If it is desired to pack a box, put in a roll of medium dry packing shaped as nearly as possible to one-half the circumference of journal, fit in the back end of the box to serve as a dust guard, fill in the angles and bottom of the box with old packing, and on top of this and along the sides and up as high as the center of the journal use fresh, saturated packing. Care should be taken to avoid having any thread connection between the waste under the journal and that in front end of oil box, also to avoid packing too high in front end of oil box, as when the waste extends above the level of the opening at the front end of the box the oil has a tendency to run out.

I believe that some cheap method could be devised for filling up the front end of the oil box with some material other than prepared packing. Some months ago I had occasion to visit a passenger yard, and was impressed with the clean appearance of the front ends of the oil boxes on their passenger trains, and upon investigation found that they did not put any packing (that is, loose packing) between the end of the journal and the front opening of the box, but instead they had a bag made from old car seat plush, filled with old packing to fill up the cavity between end of journal and end of box. This bag was made large enough so that it completely filled the opening of the box from top to bottom. Being favorably impressed with this scheme I have conducted some experiments along the same line and have found it to be a great oil saver. Of course, it would be next to impossible to equip the freight cars with these bags, but the passenger equipment might be so equipped, and in addition to their saving oil, they would add materially to the cleanly appearance of the trains.

There is one item of expense in car lubrication that I believe costs as much if not more than any other item. During the fishing season in the spring and summer months, and the "hobo" season in the fall, the railroads are required to furnish oil packing for the fishermen for lights, and for the "hobos" for heat. If the practice of robbing oil boxes of packing could be stopped I think I may safely say that the cost of lubrication could be reduced 2 cents per 1,000 miles.

Another Historic Locomotive at Purdue.

Purdue's second historic locomotive has reached the University. It is deposited with the University by the Baltimore & Ohio Railroad as a result of interest shown by Mr. J. N. Barr, Mr. F. D. Underwood and Mr. F. D. Casanave. The engine belongs to what is known as the "camel-back" type and is designated by the initials "B. & O., No. 173." This type of locomotive was originated some 40 years ago by Mr. Ross Winans, one of the most eminent of the early locomotive designers and builders.

Engine No. 173 is of the 10-wheel type and has cylinders 19 x 22 in., driving wheels 50 in. in diam., weight on drivers 56,500 lbs., and a total weight of 77,100 lbs. The shell of its boiler is 48 in. in diam. It was built in 1868 and is, therefore, 33 years old. It has been in regular service until withdrawn to be put in order for delivery to the University, after which it made the trip from Baltimore to Lafayette under its own steam in six days.

This engine of 30 odd years ago presents many interesting features, the whole machine being, in fact, designed with wonderful skill and ingenuity. The name "camel-back," as may be surmised, was given to the engine on account of the peculiar appearance produced by the large cab on the central part of the barrel, and of the rapidly receding back end, with its staircase and hand rail on the steeply inclined fire-box, all of which gave the engine a humped appearance.

It is said that the chief aim of Mr. Winans was to produce a locomotive having a maximum capacity at a minimum cost, and this he apparently succeeded in accomplishing, for it is proverbial that the Winans' engines did a larger amount of work than any other type used at that time, and the business of making them resulted in a large fortune to Mr. Winans. The Purdue "camel-back" is different from the original Winans' engine, which had eight driving wheels and no truck. The Purdue engine, also, has a Stephenson link motion and injectors, while the original engines used the hook motion and pumps. The driving tires of the Purdue engine are secured by gibs in addition to shrinkage. The driving springs are used as equalizers and are not placed central over the axles.

It is of interest to note, also, that the fire-box of Purdue's "camel-back" extends entirely back of the rear axle, giving an opportunity to make it wider than those boxes which were placed between the frames, after the manner which was common when Mr. Winans lived. It is noteworthy, also, that the wide fire-box with an inclined top is now again coming into use, being found in some of the best recent designs.

Michigan Central Railroad and the State of Michigan.

The repeal of the special charter of the Michigan Central Railroad Company, in the State of Michigan, which took effect on Dec. 31, 1901, and the reorganization of that company under the general railroad law of the State, closes an interesting chapter in the railroad history of that State.

In the year 1837 the Legislature discussed the project of building a central railroad across the State, to be owned and operated by the State, and an appropriation was made for a survey of such a line. This was followed by appropriations for the construction and operation of the line until 1846.

The project did not fully meet expectations. Numerous difficulties were experienced, and much dissatisfaction was expressed by the people, both on account of the cost and the condition of the road; and in 1846 the road was sold, by act of the Legislature, to the Michigan Central Railroad Company for $2,000,000, the act being at once the bill of sale and the special charter of the company. The charter provided that freight and passenger rates should be fixed by the directors of the company, and it also fixed the amount of its taxes at a rate much lower than is now paid by other companies under the general law. It was also provided that the State should reserve the right to re-purchase the property at any time after 30 years at a price to be fixed by the market value of its stock and bonds.

Since that time the company has built, purchased and leased a number of other lines, until it has become the greatest railroad in the State.

Whenever attempts have been made to legislate upon

the subject of freight or passenger rates, or for the taxation of the property of any railroad this charter has been in the way, it being claimed that as long as the principal system in the State could not be required to obey the provisions of a changed law, it would be unjust to require other companies to do so. At every session of the Legislature for a number of years, efforts have been made to repeal this charter and a number of suits have been tried to test its validity; but it has always withstood the test. No definite action was taken until the last session of the Legislature, when the charter was repealed, as stated above.

The next question to be settled will be to determine the amount of damages, if any, that the company will be entitled to on account of such repeal. It is now understood that the company will continue to operate as before for a sufficient length of time to satisfy itself as to the amount of damages actually sustained by the change in rates and taxes, and that suit for damages will then be begun against the State, the same Legislature that repealed the charter having made a special provision for the beginning of such suit.

The final outcome of this suit will be awaited with much interest as there are important questions involved regarding the right and power of Legislatures to grant special rights and privileges, and the extent to which dependence can be safely placed by corporations in contracts entered into by Legislatures.

TECHNICAL.

Manufacturing and Business.

The Oswego Bridge Co., with office at Oswego, N. Y., and Owasso, Mich., has been incorporated in Michigan with $150,000 capital.

The Fox plant of the Pressed Steel Car Co., at Joliet, Ill., will soon be put in operation. The plant has been closed since the strike last summer.

Reuben C. Hallett has accepted a position with the Chicago Pneumatic Tool Company's Eastern sales department, with headquarters at 95 Liberty street, New York.

"Universal" bearings will be furnished by the Universal Car Bearing Co. for 500 Great Northern cars, 25 Missouri Pacific locomotives, and 24 Illinois Central locomotives.

The American Motocar & Machine Company was incorporated in New Jersey, Jan. 18, with $500,000 capital. Incorporators: Frank G. Walker, John A. MacPeak, F. R. Hansell.

The Long & Allstatter Co., Hamilton, O., makers of punching and shearing machinery of all kinds, reports the largest business in its history. Large additions to the plant have been made.

The Fred J. Meyers Mfg. Co., Hamilton, O., is sending ticket punches to a number of foreign railroads, and its home orders are the largest ever received. Several orders have been for five thousand punches each.

P. P. Evans, formerly with the King Bridge Co., in charge of the contracting department at Boston, has accepted the position of contracting engineer with the Osborn Engineering Co., and will have headquarters at the main office in the Osborn Building, Cleveland, Ohio.

A. C. Miller, Chief Train Despatcher of the Chicago Division of the C., B. & Q. R. R., who was the author of the system of moving trains between Chicago and Burlington without the use of train orders, has resigned to accept the position of General Manager of the Miller Signal Company.

The Jones National Fence Co., Columbus, O., is going extensively into the manufacture of metallic sheathing for building construction purposes. A new factory, 100 x 100 ft., is now being built. The company recently placed an order for $65,000 worth of wire to be used in making the Jones railroad fence.

The American Steam Gage & Valve Mfg. Co., Boston, Mass., states that its business for the year 1901 showed a large increase over the year previous, and that the outlook for 1902 is still more promising. Some two years ago the company moved into its new factory, doubling its capacity. Some additions to the plant are now under consideration.

The Light Inspection Car Co., Hagerstown, Ind., is preparing to build gas and gasoline engines, as an addition to its inspection-car work. Some 2½-h.p. and some 5-h.p. engines have been built and are in service. They are satisfactory and designs are now being made for 8-h.p., 15-h.p. and 20-h.p. engines. The company expects to put five sizes on the market as soon as patterns for the largest engines are ready. An enlargement of the factory is contemplated. The extent of it is to be decided at the annual meeting of the company on Feb. 5.

Emil Swensson, formerly Manager of the Keystone works of the American Bridge Company, has opened an office at 600 Lewis Building, Pittsburgh, Pa., as a civil and consulting engineer. Mr. Swensson was with the Keystone Bridge Co. for fourteen years.

The Fort Smith & Western has bought of F. M. Hicks, of the Hicks Locomotive & Car Works, for March delivery, an 18 x 26-in. locomotive and fifteen flat cars of 60,000 lbs. capacity. The Arkansas & Choctaw has bought of the same company an 18 x 26 in. locomotive, for immediate delivery.

The growth of the Sherwin-Williams Co., paint and varnish makers, during the past 30 years, suggests that the rewards of virtue are sometimes substantial and material. In 1870 its business was conducted in a single one-story building. It now owns four large manufacturing plants in Cleveland, Chicago, Newark and Montreal. It has offices and storage warehouses in 11 cities, and employs 95 traveling representatives, who make sales in every civilized country in the world. The company's business methods and factory conduct are full of interest and are shown to visitors.

At a meeting of the Boards of Directors of the Safety Car Heating & Lighting and Pintsch Compressing Companies, Jan. 15, the following appointments were made: Mr. R. M. Dixon was elected Vice-President of the S. C. H. & L. Co. and First Vice-President and Manager of the Pintsch Compressing Co. He will have charge of the mechanical departments, embracing also adoption of all standards, and experimental work, together with the construction and operation of the gas works. He will also have charge of the preparation of all applications for patents. The assistant engineers and superintendents of the gas works will report to him. Mr. D. W. Pye was elected Assistant to the President of the S. C. H. & L. Co. and Second Vice-President of the Pintsch Compressing Co. He will have charge of the commercial interests of the companies and perform such other duties as may be assigned him by the President.

Iron and Steel.

The new rail mill of the Tennessee Coal, Iron & Railroad Co. will probably be put in operation in a few days.

William M. Seyfert, President of the Reading Iron Works, died in Philadelphia, Jan. 18, aged eighty-one years.

P. D. Mackey has been appointed Superintendent of the converting mill of the Bessemer plant, Republic Iron & Steel Co., Youngstown, Ohio.

The Lackawanna Iron & Steel Co. proposes, it is said, to increase its capital stock to $40,000,000, and to extend its operations to other branches of the iron and steel industry.

W. L. Simonton, General Manager of the Emlyn Iron Works, of East Chicago, has been appointed General Manager of the Republic Iron & Steel Co., succeeding W. E. Taylor, resigned.

Joseph Rayser, of Youngstown, Ohio, formerly Superintendent of the Laura furnace, at Haselton, Ohio, has been appointed Manager of the furnace of the Graham Iron Co., Graham, Va.

The Craig Shipbuilding Co. was incorporated in New Jersey, Jan. 17, with $1,250,000 capital. The incorporators are Cleveland V. Childs, James R. Mapletoft, H. N. Smith, of East Orange, N. J.

The United States Steel Co., which is building plants in various parts of the country to make Jupiter steel is about to begin work on a plant for Seattle, Wash. Wm. J. Wilson, of Pittsburgh, Pa., is the Engineer.

Thomas H. Tracy, President of the Toledo Railway & Terminal Company, says outside capitalists will form a company to build a blast furnace in Toledo, Ohio, which is to cost $1,000,000 and employ about 500 men.

Negotiations are under way with the Wheeling Board of Trade, for organizing a bridge and structural iron company in Wheeling, W. Va. H. G. Bowles, formerly with the Monongahela River Railroad, is Secretary of the Board of Trade.

The Algoma Steel Company, which has a contract with the Dominion Government to supply 25,000 tons of rails, expects to begin turning out rails next month. The daily capacity will be 1,000 tons, and the materials necessary to make 50,000 tons are now in stock.

The Ohio Steel Works of the National Steel Company, at Youngstown, Ohio, which has been making steel billets and sheet and tin bars for some time, has been placed on rails and will continue so the remainder of the year. It has a capacity of 100,000 tons a year.

The 4,000 tons of rails for which inquiry was made recently in this market on behalf of the Chemulpo Railroad, Corea, have been ordered from German mills, the reason being that the European firm could offer better delivery than American firms. The contract calls for delivery in Corea in July this year.

The Grant-Williams-Barker Co., to make iron and steel, was incorporated in New Jersey Jan. 14, with a capital of $200,000. The incorporators are Robert Grant, Frank Williams and Alfred K. Barker, Pine street, Rockaway, N. J. R. B. Moriarty, of Morristown, is counsel.

The first annual stockholders' meeting of the United States Steel Corporation will be held Feb. 17. The retiring directors are Daniel G. Reid, John D. Rockefeller, Jr., Alfred Clifford, William E. Dodge, Nathaniel Thayer, Abram S. Hewitt and Clement Griscom. Their successors will hold office for three years.

It is announced that the new steel plant at Monterey, Mexico, will be ready to make rails by Sept. 1, 1902. It is also said that this concern will bid for the rails to be used by the Mexican National in relaying the several hundred miles of track on its system in Mexico. Preparations are now being made for converting this road from narrow to standard gage.

Congressman Babcock, of Wisconsin, has introduced a bill at Washington to place a number of articles of the iron and steel schedule on the free list and materially reduce the duties on other articles throughout the iron and steel schedules. The articles placed on the free list are the heavy products of the furnace, while the rates on other articles of the schedule average about one-half of the present rates.

It is understood that the plant of the Cramp Ontario Steel Company, Ltd., at Collingwood, which will have an output of 300 tons of steel daily, will be in blast by June next, and contracts are now being made for future delivery. The product will be chiefly merchant bar, steel rods and billets. It is altogether likely the company will add a beam mill to the present plant. H. Prentiss Taylor has been chosen a director.

Vickers Sons & Maxim and Sheffield & Beardmore, of Glasgow, have amalgamated with a capital of about $32,500,000. The Beardmores are extensive makers of armor plate and railroad and ship material. They have their own shipyard on the Clyde, and have acquired ground for another. They have patents for a new armor plate. In May last, an effort was made by the Vickers company to get control of the Bethlehem Steel Co.

Witherbee, Sherman & Co., of Port Henry, N. Y., have leased for a term of years to Pilling & Crane, of Philadelphia, the Cedar Point Iron Furnace at Port Henry. Work will be begun at once to put in shape the furnaces, and to enlarge the stove and engine capacity to increase the output of pig iron. Pilling & Crane will also lease the furnaces at Crown Point, N. Y., using in both places ore from the mines of Witherbee, Sherman & Co., at Mineville, six miles from Port Henry. The works at Crown Point have been idle for some time.

Concrete Ties.

The Pere Marquette Railroad is experimenting with concrete ties that have been invented by some of the officers of that company. The ties are of two concrete blocks of cement and sand or cement and medium gravel or broken stone, and moulded at the ends of two 3-in. channels weighing about 4 lbs. per ft. Only moderate pressure is used to compress the concrete in the moulds. Wooden blocks about 1 ft. 6 in. wide are laid on top of the concrete and fastened by bolts imbedded in the concrete. These wooden blocks are used as a cushion and to permit spiking and may be of sufficient thickness to hold spike; or plugs for the spikes may be set in the concrete. The length of the concrete blocks is such that center of pressure and center of figure coincide.

The Elberfeld One-Rail Railroad.

Last spring a one-rail railroad with cars suspended was opened for passenger traffic for a distance of eight miles from Elberfeld towards Barmen, passing through a very narrow and crooked valley already occupied by a steam railroad and an ordinary street railroad, which were insufficient to carry the traffic; while there was not room for another road of the ordinary kind. Herr Petri, Manager of the Continental Electrical Co., of Nuremburg, lately described this novel transportation enterprise before the Berlin Railroad Science Society, and reported that it had been wholly successful and decidedly economical, having carried 3,000,000 passengers already. The sharpest curves are passed with scarcely any decrease in speed or increase in resistance, the swinging cars adjusting themselves automatically to the centrifugal force.

The "S. K. C." Inductor Alternator.

The Stanley Electric Manufacturing Co., Pittsfield, Mass., have reprinted, as their Bulletin No. 123, a serial article from the *Electrical World and Engineer*, Oct. 5, 12 and 19, 1901, giving a description of their induction alternator. The matter, written by Edward Heitmann, includes a general treatment of the subject, the mechanical construction of this alternator in detail and the maintenance of it, and some curves and data for saturation and regulation. The data and curves were obtained from tests of the machine. We quote but one of several examples of efficiency:

Curves are given for a 2,000-k.w., 2,200-volt, 60-cycle generator designed for direct connection to a water wheel operating at a speed of 240 r.p.m. The data obtained from the curves is as follows for full load:

Power Factor. Per cent.	Regulation. Per cent.	Field Current. Amperes.
100	3.0	154
90	8.2	174
80	11.0	180
70	11.4	187

The no-load field current is 146 amperes at 2,200 volts, thus the increase in field current from no load to a full load at 70 per cent. power factor is about 30 per cent. This generator will carry 100 per cent. load continuously, with a rise in temperature of 35 deg. C. It will carry 125 per cent. load continuously with a rise in temperature of 45 deg. C., and will carry 150 per cent. load for four hours. The efficiencies are as follows:

Per cent. Load.	Per cent.
125	95.0
100	94.75
75	93.5
50	92.0
25	89.0

Townsend & Downey Shipbuilding Plant.

The shipbuilding company of Townsend & Downey has been incorporated as the Townsend-Downey Shipbuilding Company with a capital of $3,500,000. The directors are John H. Cuthbert and James Alden, of New York City; W. B. Smith, of Montclair, N. J.; B. F. Warren, of Brooklyn, and M. P. Williams, of Westfield, N. J. It is announced that the company had planned to increase its holdings on Shooter's Island from 13 to 42 acres, and

that the capacity of the shipbuilding plant would be more than trebled, to permit the company to bid on vessels of any size. The company has now a marine railroad capable of taking a vessel 375 ft. long. The capacity of this will probably be increased.

Car Lighting.

A letter from London, of Dec. 28, says that the Highland Railway, which has had a number of carriages lighted by the Stone axle electric system, has abandoned the attempt to use that method of lighting, and has placed an order with the Pintsch's Patent Lighting Company, of London, for a large gas plant, and at the same time has ordered of the same company equipments for 212 carriages.

A Metric System Hearing.

Hon. J. E. Southard, Chairman of the Committee on Coinage, Weights and Measures of the House of Representatives, is sending invitations to a number of manufacturers, merchants and other business men, to appear before his Committee on Feb. 6 next, concerning the bill for the adoption by the United States of the metric system of weights and measures.

The Bridge Department of New York City.

Further changes in the Department of Bridges, New York City, have been announced. C. C. Martin, heretofore Chief Engineer and Superintendent of the New York & Brooklyn Bridge, appointed Consulting Engineer of the Department, to advise the Commissioner. Samuel R. Probasco, heretofore assistant engineer of the New York & Brooklyn Bridge, appointed Assistant Engineer in charge of machine shops, repair plants and repair forces, to date from Feb. 1.

National Bridge Company.

In addition to the note given last week about the National Bridge Co., E. M. Scofield, Manager, and formerly of the Groton Bridge Company, and later Manager of the Youngstown branch of the American Bridge Company, writes that the company has a site of approximately 40 acres in the Pittsburgh District with good railroad and river shipping facilities, and will begin grading at once. The company proposes to build a plant to make 6,000 tons of bridge and structural material a month. The power plant will consist of a battery of six gas engines of 125 h.p. each. There will be two generator units and the compressed air plant will be divided into units of 400 cu. ft. each. The main building will be 200 x 500 ft., the stock yard will be 200 x 2,000 ft. A producer plant will be provided for in case the natural gas becomes uncertain. There will be the usual complement of machine shop, foundry and a very complete forge shop. The company will carry stock and handle orders for a number of bridge plants in order to insure prompt completion of contracts. The office is in the Fitzsimmons Building, Pittsburgh, Pa.

The International Car Wheel Company.

Another car wheel company which was organized June, 1899, has taken over the management of the New York Car Wheel Works, the P. H. Griffin Machine Works, of Buffalo, and the Michigan Iron Company, of Detroit. They have bought the stocks and real estate of these companies and have made a mortgage to the North American Trust Company, of New York, for bonds to the amount of $600,000 at 6 per cent.

The Pennsylvania's Tunnel Line Through New York.

We are able now to announce the composition of the Board which will pass on the plans for the Pennsylvania's new line across Manhattan Island to Brooklyn. Lieut. Col. Charles W. Raymond, Corps of Engineers U. S. A., will be Chairman of the Board, and he, with Mr. Gustav Lindenthal, Bridge Commissioner of New York, will act as consulting engineers. The other three members of the Board will be Mr. W. H. Brown, Chief Engineer of the Pennsylvania Railroad; Mr. Charles M. Jacobs and Mr. Alfred Noble. Mr. Brown will have direct supervision of the building of the line from where it leaves the present main tracks somewhere east of Newark to Bergen Hill. Mr. Jacobs will be Chief Engineer of the North River section, that is, taking up the work at the end of the section of which Mr. Brown has supervision; and Mr. Noble will be Chief Engineer of the East River section. Mr. Cassatt will be President of the Company which will build the line. The organization has not yet been entirely completed and naturally the various types of construction have not been agreed upon.

Standard Pneumatic Tool Co.

The Standard Pneumatic Tool Company is working on the details for consolidating certain pneumatic tool companies to reduce cost, and the consolidation should in no way be considered as antagonistic to the recently formed Chicago Pneumatic Tool Company or other companies. Some of the companies that are included in the new company are: Standard Pneumattic Tool Co., International Pneumatic Tool Co., London; Philadelphia Pneumatic Tool Co., the Standard Railway Equipment Co., of St. Louis, and the Cleveland Pneumatic Tool Co. The work of organizing is in charge of Robert Lefferts as representative of Charles R. Flint & Co.

The Standard Pneumatic Tool Co. is building a $20,000 addition to its plant at Aurora, Ill. There will be two buildings, a storehouse and office building, 43 x 80 ft. and a machinery building, 32 x 110 ft., two stories high.

Philadelphia Pneumatic Tool Co.

The Philadelphia Pneumatic Tool Company expects to let the contract this week for its new building on Twenty-first street below Allegheny avenue, alongside of the Philadelphia & Reading tracks, in Philadelphia. The shop will be one story, with a basement, 96 ft. x 130 ft., with side extension for boiler house 24 ft. x 44 ft. The engine room will be in the basement, where there will probably be installed an 80-h.p. engine, together with direct-connected generating unit for lighting, etc. The boiler will be 60 in. x 16 ft., of the return tubular type, and there will be a round hollow-tile brick chimney 70 ft. high. The interior construction and roof frame for the building will be of yellow pine with slag roof. There will be four large skylights in the roof extending transversely of the building, giving plenty of light over the entire floor. The main floor will be free from partitions, except in one corner for the offices. Mr. Walter Smedley, of the Stephen Girard Building, of Philadelphia, is the architect. The work will probably be finished by May 1. A considerable number of new machine tools are now being delivered. The shop will be equipped with steam heating plant, modern toilet arrangements, lockers for the men and everything to make it a complete modern machine shop in every particular.

Signaling Notes.

The manual block system, with communication by telephone, is to be put in use on the Southern Pacific between Truckee and Sacramento, 120 miles. According to the Sacramento *Record Union* it is already in use a part of the distance; that is, Truckee and Towle, fifty miles.

Plans have been approved by the State Railroad Commissioner of Michigan for an electric interlocking and derailing appliance to be installed by the Toledo, Adrian & Jackson Railway Company at the crossing of its line with the Fayette branch of the Lake Shore & Michigan Southern at Grosvenor.

The Chicago & North Western has just placed with the Hall Signal Co. an order for additional block signals as follow: West Chicago to Rochelle, 41 miles, 63 signals; Waukegan to Carrollville, 36 miles, 63 signals; Kinnickinnic Bridge to North Greenfield, 6$^{9}/_{10}$ miles, 12 signals. All this is double track.

Laboratory Brake-Shoe Tests.

The Master Car Builders' Association Committee on Laboratory Tests of Brake-Shoes at the convention of 1901 recommended the following specification for brake-shoes:

"Shoes when tested on the Master Car Builders' testing machine in effecting stops from an initial speed of 40 miles an hour, shall develop on a cast-iron chilled wheel a mean coefficient of friction of not less than 22 per cent. when the brake-shoe presure is 2,808 lbs., 20 per cent. when the brake-shoe pressure is 4,152 lbs., 16 per cent. when the brake-shoe pressure is 6,840 lbs. In the case of steel-tired wheels, a mean coefficient of friction of not less than 16 per cent. when the brake-shoe pressure is 2,808 lbs., 14 per cent. when the brake-shoe pressure is 4,152 lbs., and 12 per cent. when the brake-shoe pressure is 6,840 lbs.; in the case of steel-tired wheels the speed being 65 miles per hour."

The specifications were subsequently submitted to letter ballot and adopted as standard by a large majority, indicating that they were satisfactory. The committee has not received any request from any railroad company to test shoes on the machine to determine whether or not the shoes now used are of a composition necessary to produce the mean coefficient of friction, and believe some effort should be made to ascertain whether or not the standard adopted is the most efficient that can be obtained for practical service. For the purpose of arriving at some more conclusive results, the committee requests replies to the following questions:

Do you use the same make of shoes on both passenger and freight cars?

Do the passenger and freight car brake-shoes used by your company have the same area of surface?

Do you wish the committee to test the shoes you use to ascertain their relative coefficient of friction to the standard adopted?

It is presumed the shoes used by your company are satisfactory, but if not entirely so, please state what objections you may have.

If your road is mountainous, do you experience any objectionable results to either the wheel or the shoe by reason of the continuous application of the brakes while descending heavy grades?

State what particular make of shoe you find best adapted to your service.

Replies are to be sent to James E. Simons, Superintendent Rolling Stock and Machinery, Pittsburgh Coal Company, Pittsburgh, Pa., not later than March 15, 1902.

THE SCRAP HEAP.

Notes.

On Jan. 16 the Union passenger station at Adams and Canal streets, Chicago, was damaged by fire to the extent of $15,000. All of the tickets in the building were destroyed.

According to the *Denver Times* every passenger train on the Union Pacific is to have an additional man, so that one of the crew can devote his attention wholly to the duties of flagman.

The Chicago & Alton is to have emergency medicine cases on all trains, passenger and freight. The surgeons of this company have organized an association, of which Dr. W. R. Rhodes, of Mexico, Mo., has been elected President.

The Secretary of the Brotherhood of Locomotive Firemen states in his annual report that the membership of the Brotherhood is now 40,720, which, it is estimated, is more than four-fifths of all the firemen in the United States and Canada.

At Wilmington, Del., where the Pennsylvania Railroad has had a good deal of trouble with people who misused commutation tickets, it is announced that after Feb. 1 all season ticket passengers are going to be required to have their photographs on their tickets.

The Southern Railway Company has issued strict rules regarding the holding of cars loaded with company's material to impress upon the employees the importance of promptly releasing such cars. Whoever is directly responsible will be charged with two demerits for each day a car is detained over 48 hours from time of arrival. Fifty demerits will call for special action on the part of the General Superintendent.

Traffic Notes.

It is announced that through trains are to be run between Cleveland and Kansas City over the Lake Shore & Michigan Southern, the Lake Erie & Western, and the Chicago & Alton, by way of Bloomington.

The Atchison, Topeka & Santa Fe has asked the United States Circuit Court for an injunction against the Railroad Commissioners of California to prevent the enforcement of the low rates for the transportation of oil which were prescribed by the Commission Dec. 3.

The newspapers say that the Detroit Navigation Company is to put in service, next summer, between Buffalo and Detroit, two large new passenger steamers which will carry 3,500 passengers each. Sleeping accommodations will be provided for 750. The boats will run through in one night and will not call at any intermediate port.

It is announced that the reduced rates on eastbound freight over the Great Northern Railway, which have been talked of in the newspapers of the Northwest for several weeks, will be put into effect on Fab. 1. The reports continue to vary a good deal as to the extent of the reductions and as to the kinds of freight to which they will be applied.

The Railroad Commissioners of Texas announce that they will adopt the reduced freight rates which they promulgated on Dec. 6. It is said that by this new tariff of the Commission many rates are greatly reduced, and that the average reduction will be more than 15 per cent. It is said that Chairman Reagan voted against the adoption of this tariff.

Another session of the Interstate Commerce Commission, at Chicago, has been appointed for January 24. It is said that James J. Hill and E. H. Harriman will appear before the Commission at that time. A number of railroad traffic managers and grain shippers have been summoned to appear and testify concerning the shipping, handling, and storing of grain which is bound from the Missouri River to Eastern points.

The Big Derrick at Fall River.

About 40 years ago a derrick was set up on the steamboat docks at Fall River, Mass., which has been a landmark there ever since. This is an iron, self-supporting derrick with a lifting capacity of 100 tons, and was built especially to handle material in the building of steamboats. Messrs. Grant & Williams, dealers in contractors' material, in New York City, are now just completing the tearing down of this derrick.

The Schierenberg Collision.

Recent German papers give the details of the disastrous rear collision on the 20th of December last on a line of the Prussian State Railroads over which run the through trains between Cologne and Berlin. The case resembles in some respects the later terrible event in New York. The through limited express for Cologne to Berlin, due at Paderborn at 11:45 a.m., passed Keimberg, the next block station, three minutes behind time. In the next bock section, between Keimberg and Schierenberg, the train ran over a horse which had strayed upon the track, and was delayed 15 minutes. The next following passenger train was waiting for the "line-clear" at Keimberg. The signalman there called up Schierenberg, thinking the operator had forgotten to signal him. When Schierenberg received this inquiry he at once set his signal as if the express had passed, though it was still in the section and he had not seen it. What possessed him thus to violate the foundation rule of his business does not appear. The officers sent by the Minister of Public Works to investigate the case could only suggest that he had been asleep. The German train rules require a man to be sent back to flag in such a case, but the Cologne express trainmen gave their whole attention to getting the horse out from under the engine and sent back no flag.

The Keimberg signal man opened the block to Schierenberg; the passenger train, drawn by two engines, went on at full speed (there was a thick fog) and struck the pushing engine at the rear of the express, which it thrust completely through the third-class car next ahead, forcing its sides apart and resting with its wheels on the under frame of this car, in which 12 passengers were killed and nine severely injured. The gas was lighted in the wrecked car, as the train was approaching a tunnel, and a repetition of the Offenbach holocaust was feared; but the gas reservoir was not ruptured, and the lights were extinguished by the collision. The occurrence of such an accident "has given a shock to the German railroad authorities, and directed attention to automatic signaling."

Freight Rates in Cuba.

Governor General Wood, of Cuba, has issued an order declaring present Cuban railroad tariffs to be excessive and detrimental to public interests. He, therefore, lays down a set of regulations on the line of the United States Interstate Commerce Law, fixing rates, and especially prohibiting the existing practice of charging more for short than long hauls. The companies have been notified that the Governor will entertain appeals if this action is regarded as unfair to them.

Railroad Officers on How to Prevent Collisions.

Following the recent collision in New York City the Chicago *Tribune* interviewed a number of railroad officers on the subject of accidents. We quote from a few of the replies:

M. J. Carpenter, President Chicago & Eastern Illinois: "It is as impossible for railroads to remove entirely the possibility of railroad accidents as it is for a man to guard himself so that he never will slip on the ice. It is hoped by the Eastern Illinois officials that the new device now being installed on the road for a test will prove successful. . . . This device keeps the signal constantly before the engineer in his cab. . . . We had an accident to-day in our Danville yards. Two locomotives came together in a collision, but no one was injured.

One engineer makes an excuse which is commonly advanced for such accidents. He declares that the steam and smoke enveloped his engine so that he could not see the track ahead. If the signaling device were in the cab such conditions could not result in accidents, because the signal could not be obscured."

H. A. Parker, First Vice-President Chicago, Rock Island & Pacific: "The public can decrease the chance of railroad accidents by assisting the railroad officials to secure competent men. It is the most difficult thing in the world to get a person who is outside of a railroad's employ to report a drinking or gambling railroad employee."

C. E. Sims, Division Superintendent of the Pennsylvania system: "Double tracking of all railroads and the building of third and fourth tracks for freight traffic, as fast as business warrants it, and the block system everywhere. I believe railroad officials ought to say oftener than they do: 'We can't let this man run any longer.' It is a hard thing to say, as in nine cases out of ten when you take an old engineer off his engine you kill him within a year or two. It is like taking his life away. But the merit system ought to prevail, instead of seniority. This is where the pension system is of advantage. Better facilities for railroad employees at the ends of divisions, where they are compelled to pass their time away from home, will increase the efficiency of employees."

Punctuality in Germany.

Statistics are kept of the number of times trains are behind time on the German railroads, and it is now announced that while the last summer time-table was in force, from May to September, inclusive, on the 26,325 miles reporting (Bavaria is not included), 179,713 express trains, 1,306,000 passenger trains and 703,767 mixed trains were despatched, running an aggregate of 60,106,265 train-miles, or an average of 399,910 miles a day, equivalent to 15.6 trains each way daily over the whole mileage. Of the whole number of trains carrying passengers, 17,901 were late, that is, 3½ out of every 1,000.

Tunnel Air.

The Paris City Council has had analyses made of the air in the tunnel of the new rapid transit railroad, and has found an excess of carbonic acid gas. Consequently, it has summoned the management of the railroad to appear before it and show how it is going to purify the air.

Continental Railroads—Slack Times.

The various state railroad managements in Germany and Austria are making special efforts to prevent, so far as possible, the discharge of railroad employees rendered superfluous by the decline in traffic, which decline, however, is proportionally much less than we are accustomed to in America in seasons of industrial depression, like 1873-74 and 1893-94. New construction, which otherwise would have been undertaken later, is to be prosecuted immediately, and men no longer needed in the operating departments are to be transferred, so far as possible, to this new work. A sort of labor "clearing-house" is established on the Prussian State Railroads, by which the bringing of men needing work into communication with work needing men will be facilitated.

Speed of the Black Diamond.

A reporter who is good at details has figured out the average speed of the Black Diamond Express of the Lehigh Valley and gives the figures, which we here quote:

The Black Diamond, west-bound, leaves New York at 12 o'clock noon, reaching Buffalo at 9:45 p.m. The run from Jersey City to Newark, 7.7 miles, is made at the rate of 16 miles an hour; Newark to South Plainfield, 17.8 miles, at 42 miles an hour; South Plainfield to Easton, 50.5 miles, at 51 miles an hour; Easton to South Bethlehem, 11.8 miles, at 34 miles an hour; South Bethlehem to Allentown, 4.7 miles, at 39 miles an hour; Allentown to Mauch Chunk, 28.9 miles, at 42 miles an hour; Mauch Chunk to Wilkesbarre, 53.8 miles, at 36 miles an hour; Wilkesbarre to Tunkhannock, 31 miles, at 49 miles an hour; Tunkhannock to Sayre, 64 miles, at 52 miles an hour; Sayre to Geneva, 73.5 miles, at 54 miles an hour; Geneva to Rochester Junction, 35 miles, at 51 miles an hour, and Rochester Junction to Buffalo, 68.1 miles, at 54 miles an hour. The average of these runs is 49.80 miles an hour. The trains were built by the Pullman Company and consist of four cars each. The engines were built especially for this service by the Baldwin Locomotive Works. They have 80-in. driving wheels.

Prizes to Agents on the Atchison.

The Atchison, Topeka & Santa Fe has just announced annual prizes ranging from $250 down to $40 to the eight station agents who have made the best records during the past year. The first prize went to H. B. Keeler, Santa Ana, Cal. The others went to Wichita, Kan.; Pueblo, Colo.; Cameron, Texas; Blackwell, Okla. T.; Chanute, Kan., and Visalia, Cal. To secure a prize an agent must show a good increase of business, his reports and correspondence must be handled in good shape, he must have a good standing with the business men of his town and must have a reputation with his townsmen for courtesy and ability.

The Millennium—Almost.

I have heard a great deal about the politeness of street car conductors on the other side," said a returning European traveler, "but I never knew just how far it was carried until I had an experience on a car in Dublin. In that city the fares on the street car lines are graduated by zones. That is, if you want to ride five miles in any direction, you pay five cents, the rate being 1 cent a mile, with a minimum fare of 2 cents. When the conductor came around I found, to my embarrassment, that I had nothing smaller than a £1 note. The conductor could not make the change, and I hardly knew what to do. 'Well,' I said, 'I suppose I had better get off, get some change, and take another car.' 'That won't be at all necessary,' said the conductor. 'I'll carry you all right. Here's a bill for you.' Forthwith he filled out a page in a book of blanks which he carried in his pocket, tore it out, and handed it to me. 'Be kind enough to pay that at your earliest convenience,' he said. At the top was written my name and address, which the conductor had asked me for. Below, in fine type, it read: 'Please call at the office of the Consolidated Tramways Company, 6 Great Thrums street, and pay two pence, amount due for fare.' I set off early next morning to pay my bill. I found that the office was a good ways off, and before I reached it to pay my 'tuppence' it had cost me 'thrippence' for street car fare. I paid my bill, got it handsomely receipted, and spent another 'thrippence' in riding back to my hotel."

Report of the Washington Park Commission.

In March the United States Senate Committee on the District of Columbia appointed a Commission for the improvement of the park system of Washington. This Commission, composed of Messrs. Daniel H. Burnham, of Chicago; Frederick Law Olmstead, Jr., of Brookline, Mass.; Charles F. McKim and Augustus St. Gaudens, of New York, on Jan. 15, submitted to the Senate Committee on the District of Columbia a report, with detailed plans, not only for the improvement of the park system, but for the location of future public buildings and the improvement of the city architecturally along consistent lines. About 200 illustrations accompany the report. In a general way the original plans of the French engineer, L'Enfant, who first planned the city, are returned to wherever possible. The plans submitted include the following important new public works in addition to many smaller projects: The park known as the Mall to be cleared and improved so as to become a beautiful and dignified approach to the Capitol from the White House; a handsome approach by a terrace to the Washington Monument, and sunken gardens between it and the White House; a Lincoln memorial; the Memorial bridge and approaches; a modern water-front; the reclaiming of Rock Creek Valley; public recreation grounds; the development of Potomac and Anacostia parks with inter-park driveways; new public buildings and the new Union railroad station, the plans for which were described last week. The report refers to the breadth of view displayed by the President of the Pennsylvania Railroad in realizing that if the Mall was to be made what the founders of the city intended it to be, no railroad should cross it, and in doing all that he could, consistent with the interests of his road, to vacate the Mall and arrange for a Union station elsewhere.

LOCOMOTIVE BUILDING.

The Missouri Pacific has ordered 25 locomotives of the Brooks Works.

The Chicago Junction is having five engines built at the Schenectady Works.

The Delaware, Lackawanna & Western is having 20 locomotives built at the Cooke Works.

The Intercolonial of Canada is having six locomotives built at the Canadian Locomotive Works.

The Cleveland, Cincinnati, Chicago & St. Louis is having 25 engines built at the Brooks Works.

The Lackawanna Iron & Steel Company is having a locomotive built at the Baldwin Locomotive Works.

The Pennsylvania Co. has 60 engines building at the Baldwin Locomotive Works. This is part of the general order for 1902 previously reported.

The Choctaw, Oklahoma & Gulf has ordered 60 locomotives from the Baldwin Locomotive Works, for 1902 delivery, instead of 50, as reported Dec. 20.

The Toledo, St. Louis & Western is having a locomotive built at the Dickson Works of the American Locomotive Co., and also one at the Baldwin Locomotive Works.

CAR BUILDING.

The Pennsylvania is having 32 coaches built at Wilmington.

Armour & Co. are building 200 refrigerator cars at their own works.

The St. Louis Valley is having six coaches built by Barney & Smith.

The Bangor & Aroostook is having 10 freight cars built at the Berwick Works.

The Missouri Pacific Association is having six coaches built by the Pullman Co.

S. D. Warren & Co. are having two freight cars built at the Milton Car Works.

The Southern Indiana is having 1,500 freight cars built by Barney & Smith.

The St. Louis Southwestern is having two coaches built by Harlan & Hollingsworth.

Ringling Bros. are having two freight cars built at the Barney & Smith Works.

The Union Pacific has ordered 3 postal cars and six coaches of the Pullman Co.

The Iowa Central has ordered 150 stock cars of the Southern Car & Foundry Co.

The Missouri Pacific has ordered 500 stock cars of the American Car & Foundry Co.

The Solvay Process Co. is having 60 freight cars built at the Middletown Car Works.

The Northwestern Elevated (Chicago) has ordered 15 coaches of the St. Louis Car Co.

The California & Northwestern is having six freight cars built at the Huntington Works.

The American Car & Foundry Co. is building 72 miscellaneous cars for different concerns.

The Grand Rapids & Indiana has ordered 50 ballast cars from the Rodger Ballast Car Co.

The Pittsburgh & Lake Erie has ordered 1,000 box cars from the American Car & Foundry Co.

The St. Louis & San Francisco has ordered 400 box cars from the American Car & Foundry Co.

The California & Northwestern has ordered six stock cars from the American Car & Foundry Co.

The Chicago, Rock Island & Pacific has ordered 50 ballast cars from the Rodger Ballast Car Co.

The Chicago, St. Paul, Minneapolis & Omaha is having 600 freight cars built by Haskell & Barker.

The Government R. R. of Jamaica has ordered 25 narrow gage box cars of the Ramapo Iron Works.

The Cincinnati, Richmond & Muncie has ordered a number of freight cars from the Laconia Works.

The Southern has ordered two combination and two postal cars from the American Car & Foundry Co.

The Denver & Rio Grande is reported to have ordered 500 stock cars of the American Car & Foundry Co.

The Louisville & Nashville is reported to have ordered 1,000 box cars of the American Car & Foundry Co.

The San Pedro, Los Angeles & Salt Lake is reported to have ordered 16 passenger cars of the American Car & Foundry Co.

The Cincinnati Southern order, reported last week, should read as follows: 1,000 coal cars, 200 box cars, and 300 furniture cars.

The Minneapolis, St. Paul & Sault Ste. Marie has added three postal cars to those recently ordered from the Barney & Smith Co. (Nov. 22, 1901.)

The Atchison, Topeka & Santa Fe has ordered 50 refrigerator cars, in addition to the order reported last week, from the American Car & Foundry Co.

The New York Central & Hudson River has ordered 25 40-ft. 40-ton standard Rodger ballast cars and one double distributing car, for May delivery.

The American Refrigerator Transit Co. is having 300 cars built at the Chicago Works of the American Car & Foundry Co., instead of 200, as reported Dec. 6.

The El Paso & North Eastern has ordered one private car, three combination cars, four coaches, 300 steel coal cars, 10 steel water cars and 140 box cars from the American Car & Foundry Co.

The Tennessee Copper Co. order for eight ballast cars, reported Jan. 10, should be credited to the Rodger Ballast Car Company, instead of to the American Car & Foundry Co. These cars will be 34 ft. long, and of 40-ton capacity, and are for April delivery.

The Illinois Central order with Barney & Smith for two chair cars to weigh 90,000 lbs., includes the following specifications: Length, 61 ft.; seating capacity, 52 ft. Also six coaches weighing 86,000 lbs., 61 ft. long, and with a seating capacity of 62. Also two dining cars weighing 114,000 lbs., 70 ft. long, with a seating capacity of 29. All these cars are 10 ft. wide, and their special equipment includes, Lappin brake-shoes, Westinghouse brakes, Hewitt brasses, three-stem Janney couplers, Forsyth curtain fixtures, Safety car heating and lighting, Standard steel platforms, McCord journal boxes, Pintsch gas, Sherwin-Williams paint, French springs and Paige tires.

BRIDGE BUILDING.

ALBION, MICH.—The Detroit & Chicago Traction Company has filed with the Michigan Commissioner of Railroads plans for its proposed overhead bridge at the crossing of the Michigan Central and the Lake Shore & Michigan Southern railroads in this city. The bridge will also cross the Kalamazoo River, and will be 135 ft. long and 22 ft. high over the railroad tracks.

ALLENTOWN, PA.—The city is considering building a bridge at Allen street, connecting the Sixth and Tenth wards, but we are told that no appropriation has been made. The highway department has recently submitted to the City Council their estimate for work this year, which is $30,000, and includes the above-named bridge or a bridge at Tilghman street.

AMSTERDAM, HOLLAND.—Bids are wanted, until Jan. 29, by the Netherlands Colonial Minister for the metal superstructure for 11 railroad bridges, 14 ordinary bridges, iron work for seven custom sheds, for roofing a salt works, and various other metal structures.

ANADARKO, OKLA. T.—Bids are wanted until Jan. 28, for several steel bridges in the county. Robert M. Carr, County Clerk.

ATLANTA, GA.—H. L. Collier, the Commissioner of Public Works, writes that no date has been set on which to receive bids for the bridge work contemplated by the city.

BAKERSVILLE, TENN.—A report from this place says that new iron bridges will probably be built over Duck and Buffalo Rivers.

BATTLE CREEK, MICH.—City Engineer Hunt is making plans for a bridge to be built this spring on East Main street.

BELFAST, ME.—The Maine Central will build a steel bridge on the Belfast & Burnham Line.

BELLEFONTAINE, OHIO.—Bids will probably be offered in March for the highway bridge at High street, mentioned in this column Jan. 10. Estimate, $5,000.

BELOIT, WIS.—An electric railroad in this city, according to report, will build a new central bridge, 360 ft. long. Robert Caldwell, City Engineer, may possibly give information.

BERTRAND, MICH.—An election was held on Jan. 20, to vote on issuing bonds for a new $5,000 bridge over St. Joseph River, between Niles and Bertrand.

BLOOMSBURG, PA.—The County Commissioners have asked the State to build two more bridges, both over Catawissa Creek, in Columbia County. During the freshet in December these bridges were carried away. Viewers have been appointed to decide upon sites.

BOSTON, MASS.—The State Legislature has recently passed an act authorizing the building of a bridge across Fort Point Channel from Oliver street and Atlantic avenue to the docks in South Boston.

BURLINGTON, IOWA.—Emmert Steece, City Engineer, writes that there is no assurance that a bridge is to be built over the Mississippi River.

CARLINVILLE, ILL.—Surveys are being made for a bridge, 100 ft. long, over Maconpin Creek to the Green Jersey county road. H. M. Minton, County Surveyor.

CARTHAGE, MO.—The Missouri Pacific, according to report, is having estimates made for rebuilding the bridge at Buck Branch Crossing.

CINCINNATI, OHIO.—The Cincinnati & Northwest Railroad proposes to build a viaduct on Linden avenue, crossing the C., H. & D. tracks.

COLORADO SPRINGS, COLO.—Contract for the steel truss bridge 125 ft. long, over Fountain Creek, has been let to the American Construction Company at $30,000.

CROOKSTON, MINN.—The question of building a bridge from Main street to the south shore of Red Lake River is being agitated.

DAVENPORT, IOWA.—The City Council is considering the resolution for a bridge to City Island, at the foot of Warren street, crossing 12 railroad tracks.

DENVER, COLO.—In pursuance of its policy of the betterments, the Union Pacific will spend a large sum during the present year on the Kansas Pacific line. We have already stated that the grades will be reduced, and we now understand that many new bridges will be built.

EVANSVILLE, IND.—Bids are wanted, until Jan. 27, for building 10 steel county bridges. Louis Legler, County Auditor.

HARTINGTON, NEB.—The annual letting of bridge contracts for bridges in Cedar County for the year 1902 will be on Feb. 20. J. F. Jenal, County Clerk.

HERNDON, PA.—The county is considering building a new superstructure upon the old piers of the Pennsylvania R. R. bridge over the Susquehanna near Herndon. The grand jury of Northumberland County last year authorized a bridge over the Susquehanna from Herndon to Port Treverton.

HOUSTON, TEXAS.—A bill has been introduced in the City Council for a bridge at the intersection of Quitman and Montgomery avenues.

HUNTSVILLE, ALA.—The court of Madison County has provided an annual fund of $8,000 for bridges in the county.

INDIANAPOLIS, IND.—The center span of the West Washington street bridge, which had recently been repaired, collapsed on Jan. 17. An entire new span will be needed. It has not yet been decided to rebuild this bridge.

KOKOMO, IND.—The county contemplates building a 120-ft. bridge on Main street, to be either a steel girder, or a double concrete arch.

LOS ANGELES, CAL.—See Other Structures.

LOUP CITY, NEB.—Contracts for county bridge work will be let on March 4, per lineal foot for new work. G. H. Gibson, County Clerk.

LITTLE FALLS, MINN.—The city is considering building a 561-ft. steel bridge over the Mississippi River at a cost of about $40,000. F. W. Cappelen, of Minneapolis, will make the plans and superintend construction. F. Carry, City Clerk, can give other information.

MCKEESPORT, PA.—A bill is before the Common Council for a steel viaduct from Versailles avenue, over Whites Hollow.

MILWAUKEE, WIS.—David S. Rose, Mayor, has recommended to the City Council the building of a new bascule bridge over the South Menominee Canal at Muskego avenue as soon as possible.

The Board of Aldermen is considering the proposed Sixth street viaduct.

NEW ULM, MINN.—Local report says that a bridge will be built across Minnesota River, at the Hindemann Ferry, near Golden Gate.

OTTUMWA, IOWA.—Regarding the report that a bridge will be built over Des Moines River at Cliffland, we are told that while the Board of County Commissioners is considering building such a bridge, no definite action has been taken. J. H. Hammond, County Auditor.

PARSON, W. VA.—A steel bridge, 470 ft. long, according to report, will be built over Black Fork.

PEMBROKE, ONT.—A bridge will probably be erected across the Ottawa River connecting Allumette Island with this town. It is estimated that a suitable bridge would cost nearly $1,000,000.

PITTSBURGH, PA.—J. Guy McCandles, Director of the Department of Public Works, has advertised for bids for the removal of four wooden spans and the north pier of the old South Tenth street bridge across the Monongahela River. This is believed to be preparatory to getting bids on the new bridge.

RICHMOND, IND.—The Pittsburgh, Cincinnati, Chicago & St. Louis will remove the viaduct from Temperanceville, near Pittsburgh, and place it over White River at Richmond. The company has no intention of building a bridge over White River at Indianapolis. The bridge contains over 2,000 tons of steel, and is 1,300 ft. long, and double-tracked. The Pittsburgh Construction Company has the contract. The location at Temperanceville has been bridged by stone arches and filled.

SAGINAW, MICH.—The Board of Public Works wants new bids, with plans, until Feb. 27, at 7:30 p.m., for a bridge, probably of bascule type, over Saginaw River at Genesee street. Two bids were received on Dec. 12 for this bridge, the American Bridge Co. and the National Bridge Co. The latter company, the lowest bidder, proposed to build a Scherzer bridge, but the Mayor vetoed the ordinance to award it the contract. H. E. Terry is Chief Engineer of the Board.

ST. JOSEPH, MICH.—The City Engineer has been ordered to make plans for the bridge in Benton Township.

SAN FRANCISCO, CAL.—City Engineer Grunsky is making plans for a steel bridge to cross Channel street at Fourth street.

SAVANNAH, GA.—The Georgia & Alabama Terminal Company has petioned the City Council, through its attorneys, McCall & Anderson, for the right to build a bridge to Hutchinson's Island, to the new terminal of the Seaboard Air Line Railway.

SELMA, ALA.—The Highway Commissioners of Dallas County have voted to build a new bridge over Valley Creek. Bids will soon be wanted.

SKOWHEGAN, ME.—The City is considering building a bridge to replace one carried away by a freshet.

SYRACUSE, N. Y.—A bill has been introduced in the State Senate, for a new bridge over the Oswego Canal on North Salina street. The bill provides for the appropriation by the State of $32.500, the city to appropriate a like amount.

TRENTON, N. J.—The Pennsylvania R. R. has made plans for a bridge over the tracks at Princeton Junction, to abolish the grade crossing at that point.

VALE, ORE.—J. F. Stevens, County Judge, writes that he will probably advertise, in March, for a bridge across Walker River, 10 miles from Ontario. The bridge will be 110 ft. long, and he will be glad to receive suggestions now.

WATERTOWN, N. Y.—J. F. Pappa, Mayor of Watertown, writes that no action has been taken in regard to the proposed bridge over Black River from Jackson street to Main street.

WILMINGTON, DEL.—Bids have been asked, it is reported, for the work of elevating the Philadelphia, Wilmington & Baltimore tracks in this city, which includes a number of bridges.

Other Structures.

BELLEFONTAINE, OHIO.—The Big Four is preparing to increase its shop facilities in this city.

BIRMINGHAM, ALA.—Plans have been made for a new freight depot to be built by the Southern Railway at Birmingham. The plans were made by Architect Frank C. Milburn, Columbia, S. C., and bids are to be received in the office of General Superintendent Dodson, at Chattanooga.

BOSTON, MASS.—The South Bay Wharf & Terminal Co., for which a special charter was granted by the last session of the Massachusetts Legislature, has finished plans for its large terminals on South Bay. They will be on Southampton street, and will also have a frontage of 3,000 ft. on the New England and Old Colony railroads. The frontage on the bay will be 1,500 ft. John C. Cobb is one of the officers.

BRISTOL, R. I.—The N. Y., N. H. & H., according to report, is having plans made for the proposed new station at Bristol.

CAMDEN, N. J.—The Pennsylvania Railroad is receiving bids for a large brick and iron power house, to be built in Camden.

CHICAGO, ILL.—The Chicago Transfer & Clearing Company will soon let contracts for a number of steel and concrete warehouses.

CINCINNATI, OHIO.—The Chesapeake & Ohio will build a new freight station at Cincinnati to replace the one destroyed by fire on Nov. 10, 1901. The structure will be built on south side of Tihrd street, between Rose and Park streets (site of the building destroyed), and will be a one-story building with brick and corrugated iron sides. Length 561 ft. 10 in.; width, 114 ft. 10 in. There will be a 40-ft. driveway through the building, and two tracks inside and two tracks outside parallel with the building. The driveway and floor will be asphalt. Roof will be covered with gravel.

COLUMBUS, OHIO.—The Pennsylvania is making plans for an addition to the repair shops at Columbus. An electric light and power plant will be installed, machine shop enlarged and boiler shop and roundhouse built.

DENVER, COLO.—The Denver & Rio Grande will enlarge its shops at Salt Lake City and at Denver.

FORT WAYNE, IND.—The Directors of the Fort Wayne Electric Works have authorized an increase of capital stock by $300,000 which will be used for increasing the size of the plant.

HARRISBURG, PA.—The Philadelphia & Reading has asked bids for a new freight station and sheds at Market street near Tenth street, the work on which will start March 1.

JEANESVILLE, PA.—The Jeanesville Iron Works Co. will build a 75-ft. addition to the machine shop, which will also be widened.

KANSAS CITY, MO.—The Atchison, Topeka & Santa Fe has a building permit for a new freight depot at Fourteenth and Hickory streets. The building is estimated to cost $47,000.

LOS ANGELES, CAL.—Shops are proposed by the South Pacific Co., in East Los Angeles. Briefly the improvements to be begun at once are:

Boiler and blacksmith shop, 120 x 250 ft.; machine shop, 120 x 250 ft.; car repair shop, 85 x 300 ft.; car paint shop, 85 x 300 ft.; transfer table, 70 x 600 ft.; car material building, 50 x 200 ft.; boiler material building, 50 x 150 ft.; roundhouse for 40 locomotives; double track steel bridge across the Los Angeles River at Alhambra avenue; minor buildings for offices, stores, sand, oil, etc.; freight-receiving depot, 50 x 600 ft.; several thousand feet of new trackage for switching and shop purposes: cost of improvements, $400,000; time of completion, within the present year.

MECHANICSBURG, PA.—A new passenger depot will be built in this town for the Cumberland Valley Railroad. The company has also in contemplation some improvements at the stations in the towns west of this city.

NASHVILLE, TENN.—The Federal Chemical Co., of Louisville, Ky., has bought 25 acres in West Nashville, between the N., C. & St. L. to the Cumberland River, where a new plant will be built at once at a cost of $250,000.

NEW ORLEANS, LA.—The Gulf Coast Shipbuilding & Dry Dock Co. is having plans made for its proposed dry docks and shops to be built in New Orleans. Samuel B. McConnico, Secretary, tells us that he is not quite ready to give out particulars. His address is Hannen Building, New Orleans.

NEW YORK, N. Y.—The Armory Board has rejected all bids received for building the new Sixty-ninth Regiment Armory on Lexington avenue, Manhattan, between Twenty-sixth and Twenty-seventh streets. The bids were all far in excess of the amount appropriated, $428,000. The bidders were John A. Cooper and A. A. Weigand, for structural steel work, $161,000; Alfred Nugent & Sons, for the main structure, $491,000; Lewinson & Just, for structural steel work, $149,975; The Springfield Construction Company, for structural steel, $142,000; John R. Sheehan & Co., for the main structure, $550,000; Thomas Cockerill & Sons, for the main structure, $518,900; Snare & Triest, for structural steel, $147,900; Thomas B. Leahy, for the main structure, $523,000; James Fay, for plumbing, $33,394. For the building complete the combined lowest bids of James Fay, The Springfield Construction Company and Alfred Nugent & Sons, footed up $665,394.

NORWALK, OHIO.—Surveys, according to report, are being made for the new shops, for the Wheeling & Lake Erie at Norwalk. It is said that about $100,000 worth of machinery has been ordered.

RALEIGH, N. C.—The Seaboard Air Line contemplates rebuilding its shops at Raleigh which were burned some time ago.

RICHMOND, VA.—The contract has been let to J. T. Wilson, for the extension of the Richmond Works of the American Locomotive Co. About $100,000 will be spent on improving these shops.

SACRAMENTO, CAL.—The Southern Pacific Co. will build 10 new station buildings on the Sacramento Division this year between Sacramento and Wadsworth. These depots will cost about $40,000.

SEATTLE, WASH.—President Hill has denied the report that work is to be begun at once on the Union Station at Seattle. The plans are well advanced, but some work remains to be done before they can be made public.

TROY, N. Y.—W. J. Wilgus, Chief Engineer of the New York Central, has invited proposals for a new station to be built at Troy, N. Y.

VANCOUVER, WASH.—The Washington & Columbia River Railroad is preparing to build a passenger station at Vancouver, at a cost of about $10,000.

WILKINSBURG, PA.—The Pennsylvania Railroad, according to report, will build a new station in this town, this summer. The new building will be about three times the size of the present structure.

YOUNGSTOWN, OHIO.—The Youngstown Steel Casting Co. is said to have secured a site for its steel casting plant, and work will be begun at once. W. R. Palmer, formerly with the Cleveland Rolling Mill Co., and more recently with the Tennessee Coal & Iron Railroad Co., at Ensley, Ala., has been appointed General Manager.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvii.)

Dining Car Superintendents.

The American Association of Dining Car Superintendents held a meeting at Chicago, Jan. 14. The President for the ensuing year is Mr. F. W. Getty, of the Chicago, Milwaukee & St. Paul; Secretary, W. E. Meyers, Chicago & Alton.

Railway Club of Pittsburgh.

The regular meeting of the Railway Club of Pittsburgh will be held at the Hotel Lincoln, Friday, Jan. 24, at 2 p.m. Business will be: Discussion, "Steam Engine Indicator in Locomotive Practice"; Paper, "Steel Tired Wheels Under Freight Cars."

Canadian Society of Civil Engineers.

At the ordinary meeting on Thursday, Jan. 16, discussion was held on papers by Messrs. F. P. Shearwood and G. C. Dunn, on "The Interprovincial Bridge, Ottawa." Mr. C. E. W. Dodwell read a paper on "A Short History of the Engineering Works of the Suez Canal."

Rocky Mountain Railway Club.

The January meeting of the Rocky Mountain Railway Club was held in Denver, Colo., on Saturday, the 18th inst., at 7:30 p.m. The topics were: Discussion of paper on "Maintenance of Air-Brakes on Freight Cars;" a paper on "Locomotive Fuel" was by W. J. Schlacks; The Question Box.

Western Society of Engineers.

The following committees of the Western Society of Engineers have been appointed to serve during the ensuing year. Finance: Ralph Modjeski, J. C. Whitridge and Andrews Allen; Publication, T. W. Snow, F. H. Bainbridge and L. P. Breckenridge; Library, J. W. Alvord, B. J. Arnold and E. L. Cooley; Membership, C. W. Hotchkiss, C. L. Strobel and H. M. Brinckerhoff; Entertainment, W. J. Karner, C. W. Melcher and J. H. Spengler.

Civil Engineers' Society of St. Paul.

The annual meeting of the St. Paul Society of Civil Engineers was held Monday evening, Jan. 13, at 8 o'clock, President Powell in the chair. The usual routine business was transacted, and the reports of officers for the past year were read and approved, after which the election of officers was held and resulted as follows: President, A. W. Münster; Vice-President, A. R. Starkey; Secretary, G. S. Edmondstone; Treasurer, A. H. Hogeland; Librarian, C. A. Winslow; Representative Board of Managers, Association of Engineering Societies, Geo. L. Wilson.

At a dinner which followed toasts were responded to as follows: "The St. Paul Society of Civil Engineers," Mr. E. E. Woodman; "The Engineers' Club of Minneapolis," Messrs. Hoag and Sublette; "Electrolysis," Mr. Oscar Claussen; "The Civil Engineer," Mr. G. S. Edmondstone; "Ancient and Modern Bridge Building," Mr. A. W. Münster; "Municipal Engineering," Mr. Geo. L. Wilson.

American Society of Civil Engineers.

We mentioned briefly last week the annual meeting of the American Society of Civil Engineers and gave the names of the officers elected. The Nominating Committee elected was as follows: District No. 1, J. G. Van Horne; District No. 2, G. H. Kimball; District No. 3, J. F. Alden; District No. 4, T. S. White; District No. 5, Ambrose V. Powell; District No. 6, James M. Johnson; District No. 7, W. W. Follett. Various other routine business of no considerable interest was transacted. On Wednesday afternoon the Society listened to a couple of interesting lectures illustrated by lantern slides. One of these was by Mr. O'Rourke, describing some of his recent foundation work, and the other was by Mr. Parsons, describing the present Rapid Transit situation. In the evening there was a reception and dance at the House of the Society. Thursday morning was given to inspection of the Rapid Transit work, and Thursday afternoon to the examination of some of Mr. O'Rourke's foundation work. Between the two, however, Mr. O'Rourke gave the Society a beautiful luncheon at Delmonico's. There were probably 300 guests present. In the evening there was a smoker at the House.

The Richmond Railroad Club.

Still another railroad club was organized at Richmond, Va., on Saturday evening, the 18th. There were about 150 gentlemen present at the preliminary meeting held in the meeting room of the Chamber of Commerce. The total enrollment of those present and by letters received could not have fallen far short of 200. This included officers of all ranks, some of the most important railroad men in the region being present or having written letters. The meeting was presided over by Major E. D. T. Myers, President of the Richmond, Fredericksburg & Potomac and the Washington Southern. Among those who spoke at some length were: Mr. G. W. Stevens, President of the Chesapeake & Ohio; Mr. H. G. Prout, Editor of the *Railroad Gazette;* Mr. W. S. Morris, Superintendent of Motive Power of Chesapeake & Ohio; and Mr. H. A. Gillis, Superintendent of the Richmond Locomotive Works. The following officers and committees were elected:

President, W. S. Morris.
First Vice-President, C. S. Churchill.
Second Vice-President, R. P. C. Sanderson.
Third Vice-President, R. E. Smith.
Treasurer, W. F. La Bonta.
Executive Committee, E. T. D. Myers, F. S. Gannon, G. W. Stevens.
Finance Committee, John S. Williams, L. E. Johnson, C. E. Doyle.

The Executive Committee met immediately after the meeting and elected Mr. F. O. Robinson Secretary.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. Angus Brown, Division Superintendent of Motive Power of the New York Central & Hudson River, was struck by a train at West Albany on Jan. 21 and instantly killed. Mr. Brown was 45 years old.

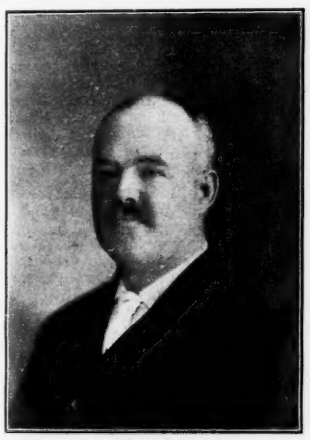
—Mr. R. E. McCarty, who, on Jan. 1, became Superintendent of the Pittsburgh Division (Southwest System) of the Pennsylvania Company, is 40 years old. He entered the service of the Pittsburgh, Cincinnati, Chicago & St. Louis (Pennsylvania Company) as a telegraph operator in 1879. In 1882 he was promoted to the position of Train Despatcher, then in 1895 he became Assistant Trainmaster, and the following year Trainmaster.

—Mr. R. P. Blake, Mechanical Engineer of the Northern Pacific, was born in 1874. He received the degree of Mechanical Engineer at the University of Minnesota in 1897 and entered railroad service the same year as special apprentice on the Northern Pacific. He then took up the work of general inspection of materials, assuming charge of all tests in June, 1900. Mr. Blake was appointed Mechanical Engineer to succeed Mr. Goodell, in November, 1901.

—Mr. Ramsey M. Cox is a native of Texas, having been born at Waco, June 21, 1863. At the age of 19 he took a position with the Missouri, Kansas & Texas as operator and remained with this company until 1882, when he went with the Texas Central, and has been with them ever since. For 10 months Mr. Cox was an operator and clerk, then agent at different stations along the line, until 1895, when he was appointed traveling agent. Three years later he became Superintendent of Transportation. He received his new appointment, that of Superintendent, Jan. 1, this year.

—Mr. M. Sweeney, the new General Superintendent of the Minneapolis & St. Louis, was formerly connected with the Missouri, Kansas & Texas in a similar capacity. Mr. Sweeney was born in Ireland 53 years ago. He began his railroad career in 1872 as a clerk for the latter company and remained with them in various positions until 1876, when he became Car Accountant of the St. Louis, Iron Mountain & Southern (Missouri Pacific). This position he held for six years, at the end of which time he went with the Richmond & Allegheny. For one year, 1886 to 1887, he was Superintendent of Transportation and Purchasing Agent of the Mobile & Ohio; then for one year (1887-1888) General Superintendent of the Kanawha & Ohio, and in the last-named year he returned to the Missouri, Kansas & Texas as Superintendent of Transportation, becoming its General Superintendent in 1897.

—The new Superintendent of Motive Power and Car Equipment of the Mobile & Ohio, Mr. G. S. McKee, was previously Division Master Mechanic of the Wabash Line. He was born in 1859 and his railroad career dates from 1870, when he served for a number of years in the mechanical department of the Missouri, Kansas & Texas. In the early part of 1880 he resigned from this position to take service with the Strong Locomotive Company, of New York City, and remained there three years. On leaving their service he went to Indianapolis, as General Foreman of the Cleveland, Cincinnati, Chicago & St. Louis, afterwards becoming Master Mechanic of the St. Louis Division of the same company. In the fall of 1898, Mr. McKee became Master Mechanic of the Wabash at Moberly, but was afterwards transferred to Fort Wayne in a similar capacity on the East Detroit and Buffalo Divisions. He resigned from this position on Jan. 1, this year, to take up his new duties with Mobile & Ohio.



ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—W. A. Nettleton, formerly Superintendent of Motive Power and Machinery of the Kansas City, Fort Scott & Memphis, has been appointed Assistant Superintendent of Motive Power of the A., T. & S. F., with headquarters at Topeka, Kan., effective Jan. 20.

Chicago & Alton.—A. L. Humphrey, heretofore Superintendent of Motive Power and Car Department of the Colorado & Southern, has been appointed Superintendent of Motive Power of the C. & A., with headquarters at Bloomington, Ill., succeeding C. M. Mendenhall, resigned.

Chicago, Milwaukee & St. Paul.—A. H. Thomas, heretofore General Foreman at Chicago, has been appointed Mechanical Engineer, with headquarters at West Milwaukee, Wis.

Chicago, Rock Island & Pacific.—W. H. Davisson, heretofore General Roadmaster of the Lines West of the Missouri River, has been appointed Assistant Chief Engineer, succeeding R. W. Day, resigned. A. C. McColl, heretofore Roadmaster, succeeds Mr. Davisson, and L. B. Holt, heretofore Acting Division Engineer of the Lines in Iowa and Missouri, becomes Division Engineer of same lines. M. Bishop, heretofore Roadmaster, has been appointed Acting Superintendent of Bridges and Buildings, succeeding W. R. Cannon, resigned.

Chicago, Rock Island & Texas.—W. H. Firth has been appointed General Passenger Agent, succeeding C. B. Sloat, resigned.

Coahuila & Pacific.—The officers of this railroad, now under construction, are: President, J. J. Detwiler; General Manager, A. W. Lilliendahl; General Traffic Manager, F. A. Lilliendahl; Chief Engineer, T. S. Abbott; Superintendent, J. D. Melville, and Auditor, J. B. Tartt, all of Saltillo, Mex. (See R. R. Construction column.)

Detroit Southern.—T. C. M. Schindler, heretofore General Freight and Passenger Agent of the Cincinnati Northern, has been appointed General Freight Agent of the D. S.

Erie.—The jurisdiction of H. B. Chamberlain, Eastern Freight Traffic Manager, will be extended over the entire system. It is understood that Mr. Chamberlain's title will be Traffic Manager.

Galveston, Harrisburg & San Antonio.—H. F. Anderson has been appointed Acting Superintendent of the Houston Division, during the absence of Superintendent J. T. McQueeney. Mr. McQueeney has been granted leave of absence owing to ill health.

Missouri, Kansas & Texas.—A. I. Miller, heretofore Acting Purchasing Agent, has been appointed Purchasing Agent.

New York Central & Hudson River.—Donald L. Sommerville has been appointed Division Engineer of the Rome, Watertown & Ogdensburg Division, succeeding Charles J. Parker, resigned. (See Rutland.)

New York, Ontario & Western.—C. E. Knickerbocker, formerly Assistant Engineer of the Northern Division, has been appointed Engineer Maintenance of Way.

Northern Pacific.—H. E. Still has been appointed Assistant General Freight Agent.

Pacific Coast.—J. G. Woodworth, Traffic Manager, having resigned, the correspondence relating to the traffic of this company will hereafter be addressed to Messrs. Goodall, Perkins & Co., General Agents, San Francisco, Cal.

Pennsylvania.—J. M. James, heretofore General Inspector, has been appointed Assistant Engineer of Motive Power of the Buffalo & Allegheny Valley Division, effective Jan. 15. J. Buckelew, heretofore Assistant Engineer at Tyrone, Pa., has been appointed Assistant Engineer, with headquarters at Pittsburgh, Pa., succeeding R. T. Morrow, promoted.

Philadelphia & Reading.—J. J. Whalen, heretofore Division Master Mechanic at Cressona, Pa., has been appointed to succeed W. M. Stellwagon, resigned, as Division Master Mechanic at Palo Alto, Pa.

Reading.—Vice-President W. R. Taylor will assume the duties of Secretary, succeeding the late A. H. Moore.

Rutland.—C. J. Parker, heretofore Division Engineer at Watertown, N. Y., of the New York Central & Hudson River, has been appointed Chief Engineer of the Rutland, with headquarters at Rutland, Vt., effective Jan. 20.

G. P. Jarvis has been appointed General Manager, with headquarters at Rutland, Vt. This is a new position recently created. C. Morgan succeeds O. F. Harrison as Treasurer.

Salt Lake & Los Angeles.—At a meeting of the Directors held recently, J. F. Smith was elected President. J. Jack was elected Vice-President to succeed Mr. Smith.

Southern Missouri & Arkansas.—F. E. Dewey has been appointed Superintendent of Construction.

Texas & New Orleans.—The operating divisions known as the Louisiana, Sabine and Dallas Divisions have been abolished, and the jurisdiction of G. J. Hartman, Superintendent, has been extended over the whole of this company's lines. G. R. DeYoung has been appointed Assistant Superintendent, with headquarters at Beaumont, Texas. Effective Feb. 1.

Texas & New Orleans (Southern Pacific).—On Jan. 14, E. H. Harriman was elected President, succeeding I. E. Gates.

Toledo, St. Louis & Western.—We have the very best authority for denying the persistent reports and statements that D. F. Milne, Superintendent of Car Service, has resigned.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BES LINE CONSTRUCTION CO.—Incorporation was applied for, Jan. 8, in Missouri, by the above-named company which proposes to take over the Blackwell, Enid & Southwestern, from which it derives its name, and continue it from its present terminus at Enid southwest to Vernon, Texas, making the total length of the line 250 miles, in place of the present length of 85. The capital is $600,000 paid up, and Breckinridge Jones is the largest shareholder.

BROWNSVILLE & UNIONTOWN STREET.—Incorporation was made, Jan. 13, of a company to build an electric line from a point on the borough line of Brownsville, Pa., to the Borough of Uniontown, 12 miles distant. This line presumably joins the West Brownsville & Washington and serves as a continuation of it. A. B. Ledwith, of Brownsville, Pa., is President of both companies. (See West Brownsville & Washington Street.)

BUFFALO, ARCADE & ATTICA.—This road, now in operation between Attica and Arcade, N. Y., 28 miles, is building an extension from Arcade to Crystal Lake, seven miles, and also has one under consideration between Java Center and Buffalo, 29 miles. S. T. Lyke, of Arcade, N. Y., is General Superintendent.

BURLINGTON, CEDAR RAPIDS & NORTHERN.—It is said that this company has bought a tract of land in West St. Paul, Minn., by means of which entrance will be made into St. Paul, over its own lines. At present an arrangement is in effect with the Chicago, Milwaukee & St. Paul, for trackage into St. Paul and Minneapolis. (Construction Supplement, Oct. 11, 1901.)

CAMPBELL'S CREEK.—An officer writes that all the grading has been done on this line in West Virginia from Dana Junction, 14 miles up Campbell's Creek to its head, with a short branch. The contractors are Lane Bros., and the work is completed except for laying 1½ miles of track. It is not proposed to buy any rolling stock at present. The company has very little outside business beyond its coal interest, but may put on a passenger service later. J. E. Dana, President, Charleston, W. Va.

CHESAPEAKE BEACH.—Work is reported begun on grading and laying a second track on this line which extends between Chesapeake Junction, D. C., and Chesapeake Beach, Md., 30 miles. The work is at present being done near Lyon's Creek and is to be graded to Patuxent.

CHICAGO & NORTH WESTERN.—An officer writes that the report of the extension to be made between Princeton, Wis., and Elroy, is incorrect, and that no such work is planned at present. (Jan. 10, p. 31.)

CHICAGO TRANSFER & CLEARING.—An officer writes that 109 miles of track have been laid in this company's large transfer and clearing yard, Chicago, and that contracts will soon be let for several steel and concrete transfer warehouses. H. H. Porter, Jr., is President, and A. W. Swanitz, 355 Dearborn street, Chicago, Chief Engineer.

CINCINNATI & EASTERN ELECTRIC.—An officer writes that this new electric line in Ohio, between Cincinnati and New Richmond, 21 miles distant, is completed, as far as grading and track laying is concerned, and that the road will be in operation April 1. G. R. Scrughan is President and General Manager.

COAHUILA & PACIFIC.—An officer sends the following information about this company's line in Mexico. The total length from Saltillo to Torreon is 192 miles, all of which is under contract. Grading is completed for all except 10 miles of the distance, and track has been laid between Saltillo and Viesca, 150 miles. The line is now in operation for the 100 miles between Saltillo and Parras, and it is thought that it will be ready for use throughout its entire length some time next April. For a list of officers, see under Elections and Appointments.

CONTINENTAL.—New maps have been furnished the Minnesota Railroad & Warehouse Commission by this company which show its proposed route from the Lake of the Woods in British North America to Bedford in the southern part of Iowa, crossing the Northern Pacific at Perham and Vining; the Great Northern at Alexandra and Murdock; the Minneapolis, St. Paul & Sault Ste. Marie at Glenwood; the Chicago, Milwaukee & St. Paul at Renville, and the Chicago & North Western at Delhi, Lumberton, Jefferson and Windom. It is planned to begin work on the road at the northern end where connection is made with the Canadian Northern.

COPPER BELT RAILWAY & POWER.—This company has been incorporated in California, with a capital stock of $2,000,000 to connect the Trinity copper mine, owned by Thomas Lawson, and the Bully Hill mine owned by H. J. De la Mar. The distance between these properties is 24 miles.

EASTERN TEXAS.—Work is reported completed on this company's line between Lufkin and Kennard, Texas, 27 miles, and the proposed extension between Kennard and Crockett, 20 miles, is under way.

FISH RIVER.—Location is reported completed on this line, which is to be operated under lease by the Bangor & Aroostook, between Ashland and Fort Kent, Me., 51½ miles, by way of Portage Lake, Eagle Lake and Wallagrass. Contract is said to have been let to the Aroostook Construction Co.

FONDA, JOHNSTOWN & GLOVERSVILLE (ELECTRIC.)—An officer sends the following information about work now being done on the company's lines: The Amsterdam Street R. R. is being extended three miles west to Tribes Hill, N. Y., and 15 miles east to Schenectady, and the Cayadutta Electric R. R. is being extended five miles, from Johnstown to Tribes Hill, meeting the Amsterdam extension at that point, both of these lines being owned by the same parties. The grading and masonry work between Amsterdam and Johnstown is being done by D. A. Crage & Co., of Buffalo. The contract for the grading and masonry on the line from Amsterdam to Schenectady has been let to the Mohawk Valley Construction Co. The 10-mile section from Amsterdam east has been sublet to Pitt, Hankin & Trundle, Richmond, Va., the remaining five miles being done by the Construction Co. itself. The Amsterdam Street R. R. is also being extended 2½ miles north, to the village of Hagamans, this grading and masonry being done by the Mohawk Valley Construction Co. The contracts for several bridges have been awarded to the American Bridge Company. Bids will probably be asked shortly for nine motor cars of the largest type.

FORT SCOTT, IOLA & WESTERN.—The line between Moran and Iola, Kan., 13 miles, has been finished. Work is in progress on the projected extension to Piqua, which is eight miles beyond Iola. Further extensions are contemplated.

HARTFORD & SPRINGFIELD ELECTRIC.—The opening of the new electric line between Hartford, Conn., and Springfield, Mass., 26 miles, took place on Jan. 13. The electric line is now unbroken between Boston and Meriden by way of Worcester, Springfield and Hartford, a total of 135 miles, paralleling the New York, New Haven & Hartford and Boston & Albany.

INTERNATIONAL & GREAT NORTHERN.—An officer denies the report that this line is to be extended at present between Dallas and Corsicana, Texas. (Jan. 10, p. 32.)

KENT NORTHERN.—Notice is given to the New Brunswick Legislature of an application to be made for charter for an extension of the company's line from Kent Junction, on the Intercolonial, through the counties of Kent and Queens to form a junction with the Central R. R. of New Brunswick, near Chipman.

L'ASSOMPTION.—An officer writes that 21 miles have been laid on this line in Quebec during 1901, between L'Epiphanie and Charlemange. No further work is under contract or construction at the present time.

LAWTON & WICHITA MOUNTAIN.—Charter has been granted in Oklahoma for a railroad 40 miles long between Lawton and White Sulphur Springs. The capital stock is $200,000. J. B. Chapman, of Lawton, Okla. T., is interested.

LICKING RIVER.—An officer writes that this company has laid track on six miles of extension during 1901 between Salt Springs and Cave Branch, Cave Branch and Bangor, and Bangor and Morgan, in the State of Kentucky. No new work is at present being done. E. W. Strack, General Manager. (Construction Supplement, Oct. 11, 1901.)

MANCHESTER & ONEIDA.—An officer writes that eight miles of track have been laid between the points named in Iowa during the past year, and that no more work is at present contemplated. E. M. Carr, President, Manchester, Iowa.

MANISTIQUE, MARQUETTE & NORTHERN.—The Manistique & Northwest, running from Manistique, Mich., to the connection with the Duluth, South Shore & Atlantic, at Shingleton, has been purchased by D. W. Kaufman and R. R. Metheany, and it will be reorganized under the above title, with a capital stock of $2,000,000. It is the intention of the purchasers to extend the line to Marquette in connection with the car ferry, which is to be run between Northport and Traverse City, where a connection is made with the Traverse City & Leelanau.

MEXICAN CENTRAL.—It is announced by the General Manager, H. R. Nickerson, that surveys are now being made for a number of branch lines in Mexico, and that some of these designed to penetrate mining and agricultural districts at present without transportation facilities, will be completed during the present year.

MEXICAN NATIONAL.—The last reports about the extension of the Matamoras Branch from San Miguel to Monterey are that everything is in readiness and work is likely to begin within a month or so. (Nov. 29, p. 832.)

MICHIGAN SUBURBAN.—This company has been incorporated under the laws of Michigan, with a capital stock of $200,000, for the purpose of operating the road from Lansing to St. Johns, recently built by the Lansing, St. Johns & St. Louis Co. This line was built for an electric line, but is to be operated for the present at least by steam.

MINERAL SPRINGS.—Work is reported begun on this line from Middlesboro, Ky., into the coal lands eight miles away. A connection is to be made with the Tennessee Northern, which will build to meet this line from La Follette, Tenn. (Nov. 29, p. 832.)

MISSISSIPPI & SOUTHWEST.—This company has been incorporated in Mississippi, to build a line from Webb, in Tallahatchie County, to Clarksdale, in Coahoma County, Mississippi, thence to Glendale, in the same county, and across the Mississippi River into Arkansas at Helena. J. M. Brooks, of Clarksdale, Miss., is interested.

MOBILE & MEMPHIS.—Surveys are reported for this company's new line from Hattiesburg, Miss., to Grenada or Memphis. The incorporators are: Chester H. Pond, of Morehead, Miss.; Adam Byrd, of Philadelphia; E. T. Thompson, of Baltimore, and J. W. Stover and William F. Allen, of New York.

MORELIA & ACAMBARO.—A survey of the route of the proposed railroad between Morelia and Acambaro, Mex., which is to be built by the Morelia & Acambaro Timber & Land Co., is to be made at once, and it is said that the prospects of immediate building are good. The company has a capital stock of $6,000,000 and the incorporators are M. L. Ward, of Newark; David Buchannon, of New York; Charles M. Heath and others, of Trenton, N. J. The distance between the points named is about 50 miles, and the Mexican National has a route in operation between them.

NASHVILLE & MISSISSIPPI DELTA.—Contracts are said to have been let for a line from Okolona, Miss., west to Granada, 30 miles, and it is thought that work will be begun some time during March. A line is also projected between Granada and Nettleton, Miss., 75 miles.

NEW YORK & PENNSYLVANIA.—An officer writes that the five-mile extension between Shingle House, Pa., to Ceres, N. Y., was completed and put in operation, Dec. 16, 1901. No other extensions are contemplated at present. The line is now in operation continuously between Erie Junction and Ceres, a distance of 57 miles.

NEW YORK RAPID TRANSIT.—The proposition to extend the Rapid Transit tunnel from the City Hall down Broadway and under the East River to Brooklyn, was approved by the Supreme Court, Jan. 17, 1902.

NEW YORK ROADS.—At the annual meeting in New York City of the Merchants' Association, Jan. 14, a letter was approved to Mayor Low calling his attention to the growing need of a belt line railroad along the water front for the rapid collection and transmission of merchandise and the relief of the increasing congestion of the streets in the business quarter. The Association suggests that due measures be taken to secure to the city permanent control of this valuable franchise.

NORTH CAROLINA ROADS.—An officer of the McMullen-Miller Lumber Co. writes that seven miles of railroad in North Carolina were built during the past year between Giddensville and Daubersville, N. C. The road is being built to Dunn, 21 miles beyond, as it is needed. It is at present a standard gage logging road, but the company expects before long to take out a charter. Seventy miles are at present in operation. W. A. McMullen, General Manager, Faisons, N. C.

OKLAHOMA & TEXAS SOUTHERN.—An officer writes that the projected route of this company in Texas will start from the Red River and run south to Bowie, Springtown, Weatherford, Hamilton, Lampasas, Sealy and other towns into Houston to deep water, a total distance of about 350 miles. Surveys have been made between Red River and Stephensville, 125 miles of this distance. Contracts are to be let about March 1. The surveys give an average grade of 1 per cent. and involve a 1,200-ft. bridge across the Red River, a 900-ft. bridge across the Brazos River and three smaller ones. The company at present owns two engines and three passenger cars and expects to order new equipment about April 1. The line will connect at Red River with a line now building from Kansas through Oklahoma, and it is the plan of the incorporators to maintain a trunk line south through Texas. (Jan. 10, p. 32.)

OREGON SHORT LINE.—During 1901 this company built 127 miles, and also added 76 miles by purchase. Early in May it absorbed the Utah & Pacific, which had been built in its interests by other parties and extended it 42 miles southwest to Calientes on the route to Los Angeles. In February last it completed the Wyoming Western running from Moyer Junction, Wyo., to Glencoe, 19 miles. The Salmon River Branch was built from Blackfoot, Idaho, to Mackay, Idaho, 85 miles, reaching the White Knob copper district, and it is to be extended this spring to Thunder Mountain. The line has also been improved by several cut-offs and other betterments, including the practical completion of the Idaho Division and laying of 80-lb. rails in Beaver Canyon, and also the building of two steel bridges in Bear River Canyon. The road has had the most prosperous year in its history, with gross earnings of approximately $9,000,000, an increase of about $1,000,000 over those of the previous year. The operating expenses during this time were about $5,000,000, including taxes.

PINE BLUFF & WESTERN.—Contract for extending this line 10 miles from its present terminus, at Doyleton, Ark., has been let to Reaves & Cook, of Little Rock. The road has been in operation for some time between Pine Bluff, Ark., and Doyleton, 15 miles. (Nov. 1, p. 764.)

PITTSBURGH & SOUTHWESTERN.—Incorporation was made, Jan. 13, of a company, with a capital stock of $80,000, to build a railroad from a point on the line of the St. Clair Terminal Co., Allegheny County, Pa., to a point on the Wheeling Division of the Baltimore & Ohio near Cochran's Mills, Snowden Township, Allegheny County, Pa.

PORT ARTHUR CANAL & DOCK.—Charter for this company, which is to operate the ship canal bought Jan. 7 by the Kansas City Southern, and maintain docks, wharves, elevators, warehouses and terminals, was filed at Austin, Jan. 8. The directors are S. R. Knott, of Kansas City; D. C. Bevard and Hiram Glass, of Texarkana; R. A. Greer, of Beaumont; and J. W. Henderson, of Port Arthur.

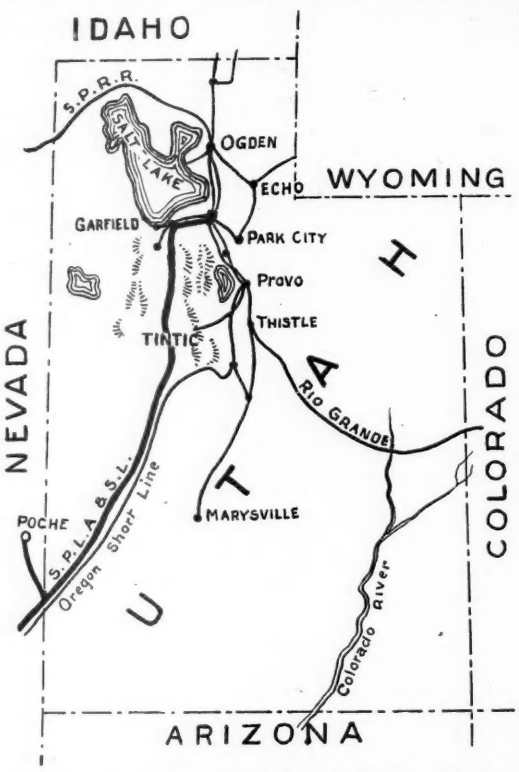
QUEBEC & JAMES BAY.—An officer writes that work has begun on this new line from Quebec to James Bay, and the mouth of the Nottaway River, and that a subsidy of $192,000 has been voted by the Dominion Government for the first 60 miles. The James Bay district reached contains a large amount of valuable spruce timber and has also a great amount of water power available in its rivers. (Construction Supplement, Oct. 11, 1901.)

ST. LAWRENCE & MEGANTIC.—This company is petitioning the Quebec Legislature for incorporation of a new railroad along the south shore of the St. Lawrence River from Becancoeur and La Grande Riviere Duchene to a point at or near the head of Lake Megantic.

ST. LOUIS, MOREHOUSE & SOUTHERN.—An officer writes that 27 miles of track have been laid on this line during 1901, between Morehouse and Tallapoosa, Mo. The line is under contract for 17 miles additional to C. Warren and R. Criswell, and surveys have also been made from During Mill to the State Line, nine miles beyond.

SALINE RIVER.—This road, between Draughan, Ark., and New Edinburgh, 8½ miles distant, has been completed and trains are to be put on at once. It is said that an additional extension of two miles will be built some time during the coming spring. (Oct. 18, p. 730.)

SAN PEDRO, LOS ANGELES & SALT LAKE.—On Jan. 2, this company filed its first approved map of its route territory in Utah. The survey in question was adopted by the directors at a meeting at Los Angeles, Dec. 26, 1901. The map shows that the road will leave Salt Lake and run west to Garfield through Toele County to the initial point, which is situated 13 miles east of the tracks of the Oregon Short Line. It then follows the route indicated to Tintic. On the way in Rush Valley



it will touch a mining district in which Senator Clark is interested. The route south after reaching Tintic is still more or less indefinite, but it is understood that it will parallel the Oregon Short Line in order that connections may be made with the Pioche Branch road over which there has been persistent legal fight since the hasty survey last year. The total length of the present San Pedro extension, as announced in a technical description given by Vice-President J. R. Clark, is 20 miles.

SANTA FE, PRESCOTT & PHOENIX.—Operation of the Hell Canyon cut-off was begun on Dec. 29, 1901. This line is about 23 miles long and starts at a point four miles below Ash Fork, in Arizona, and ends near Milepost 30 on the old line. The cut-off is three miles shorter than the original line and the maximum northbound ascending grade is 1½ per cent., as against 3 per cent. The southbound ascending grade has been reduced from 1 per cent. to ¾ of 1 per cent., and the maximum degree of curvature on the new line is 6 deg. in place of 12 deg. on the old road. The total number of degrees of curvature eliminated by the new line is about 2,500, and the maximum elevation is 419 ft. lower on the new line than on the old. The old line crossed 40 bridges, and on the new line, aside from the Hell Canyon steel viaduct and the Little Hell Canyon bridge, there are but eight pile and trestle bridges.

SLATE RUN.—Work is reported in progress on the extension from Manor Fork to Francis, Pa., 12 miles, and also on the five-mile branch along Cushman Creek. The line is now in operation between Slate Run and West End, Pa., 15 miles.

STEEL CITY (ELECTRIC).—This company has been organized in Birminghm, Ala., to build 20 miles of electric line between Birmingham and Ensley, Bessemer and Brookside. The capital stock named is $750,000, and the company intends to erect a power house on the Warrior River near Birmingham. The incorporators are R. R. Zell, S. E. Thompson and others, of Birmingham and Ensley, Ala.

SUWANEE & SAN PEDRO.—During the past year 13 miles of track have been laid on this line in Florida, between Stokely Junction and Mayo. The work is now in progress on an extension to Perry, 30 miles beyond. A further extension from Perry to Wacissa, 30 miles, is projected, but as yet has not been surveyed. (Official.)

WEST BROWNSVILLE & WASHINGTON STREET.—This company was incorporated, Jan. 13, with a capital stock of $132,000, to build an electric road from a point near East Washington, Pa., to West Brownsville, on the Monongahela River, 20 miles distant. (See also Brownsville & Uniontown Street.)

GENERAL RAILROAD NEWS.

BALTIMORE & SOUTHERN.—First mortgage prior lien 5 per cent. 50-year gold bonds are being offered by M. C. Mengis, 17 Broadway, New York. The total issue is $1,600,000, limited to $20,000 a mile. The offer includes a bonus of stock at the rate of one share ($100) for each $200 of the first $300,000 bonds. The road in question is organized to build from Baltimore to Drum Point, Md., 18 miles, with right to build branches additional.

BAY OF QUINTE.—First mortgage 5 per cent. sinking fund 25-year gold bonds of this company to the extent of $650,000 are being offered at 103 and interest by N. W. Harris & Co. They are subject to call at 105 and interest after Jan. 2, 1907. The bonds are issued to provide for a portion of the cost of the company's present line, and also for 30 miles of extension. The aggregate mileage operated at present is about 88, including 23 miles of trackage rights.

BRADFORD, BORDELL & KINZUA.—This company acquired by lease, Nov. 1, 1901, that portion of the Pittsburgh & Western between Foxburgh, Pa., and Mount Jewett, 95 miles. The line as now operated extends between Bradford and Foxburgh, 124 miles, with a branch from Ormsby Junction to Smethport, seven miles.

BROOKLYN RAPID TRANSIT.—Gross receipts from operations for the five months ending Nov. 30, 1901, were $5,498,519, as against $5,159,930 for the same period last year. Expenses, however, during this period increased from $3,229,484 to $3,762,359, leaving net receipts $1,736,160, as against $1,930,446 in 1900, a decrease of $194,285.

CHOCTAW, OKLAHOMA & GULF.—Drexel & Co., Brown Bros. & Co., and W. H. Newbold's Son & Co., of Philadelphia, offer $3,435,000 of 5 per cent. consolidated mortgage gold bonds which is to be partly used for the purchase of an additional 1,156 miles of road from the Western Oklahoma upon which this consolidated mortgage will be a first lien, and also a lien upon the other property of the company, subject to the divisional and underlying bonds. It is specified that the mortgage may be increased from time to time for the acquisition of new mileage, but that the amount of bonds thus issued shall not exceed $15,000 per mile. The unsold balance is offered for sale at 107½. Upon the completion or acquisition of the lines referred to above, the authorized issue of the consolidated mortgage of the Choctaw, Oklahoma & Gulf, will be $12,460,000, of which $9,025,000 is to be held by the trustee to retire underlying and divisional bonds. These bonds mature May 1, 1952.

GULF & BRAZOS VALLEY.—This railroad, which has at present about 11 miles of line in operation between Peck City and Mineral Wells, Texas, was sold Jan. 7 to satisfy judgments. The purchaser was E. B. Carver, President, who paid $16,000 for it. The earnings of the road during the year ending Oct. 31, 1900, were $9,670, with total stock and bonds outstanding of $93,500.

NEW YORK CENTRAL & HUDSON RIVER.—A parcel of land bounded by Forty-fifth and Forty-seventh streets, and Park and Lexington avenues, New York City, has been bought by this company, and in addition a strip 75 ft. wide which runs through about seven city blocks. This is in accordance with recent plans for bettering facilities at the Grand Central Station, which will probably involve a loop and sub-station beneath the present structure and on a level with the Rapid Transit Road. At the meeting of the directors, Jan. 15, a proposition to increase the capital stock from $115,000,000 to $150,000,000 was announced, the $35,000,000 additional to be applied to the change in the tunnel, and also to the purchase of new rolling stock and to betterments.

PENNSYLVANIA.—A tract of land in Pittsburgh, known as the Point, lying at the junction of the Monongahela and Allegheny Rivers, has been bought from the Shenley estate. It is said that the transfer will involve $15,000,000, and that the land is to be covered with warehouses. It is at present occupied by shanties and various small buildings. The transfer is said to be the largest ever made in Pittsburgh.

PENNSYLVANIA & NORTHWESTERN.—An offer is reported made for the capital stock of this company by the Pennsylvania on the basis of $1,000,000 stock for the $2,250,000 capital stock of the Pennsylvania & Northwestern. The Pennsylvania & Northwestern is located in the central part of the State and runs from Belwood to a point near Horatio in the soft coal region, a total distance of 62 miles.

PHILADELPHIA, WILMINGTON & BALTIMORE.—At a recent meeting of the stockholders President Cassatt stated that it was deemed wise to consolidate with the Baltimore & Potomac for the purpose of placing the line between Philadelphia and Washington on a strong basis and for making a number of improvements. These plans involve an increase of $8,000,000 new capital stock and the question will come before the shareholders again at a later date.

PITTSBURGH & LAKE ERIE.—Notice is given the stockholders of this company that at the annual meeting in Pittsburgh, Jan. 28, the proposition will be laid before them of authorizing an increase of $4,000,000 in the company's capital stock. It is proposed to issue $2,000,000 of this next July and to hold the remainder until it is needed. The purpose of the increase is for permanent betterments of the line.

ST. LOUIS & SAN FRANCISCO.—The Texas Railroad Commission has refused this company's application to lease and operate the St. Louis, San Francisco & Texas, running between the Red River and Sherman, 14 miles. Owing to this action, this short piece of road will have to be operated as a separate property and must maintain general offices in Texas. There are three other railroad lines in Texas belonging to the St. Louis & San Francisco System which are also required to maintain separate general offices in the State. These are the Red River, Texas & Southern, running between Sherman and Carrollton; the Paris & Great Northern, between Paris and the Red River, and the Fort Worth & Rio Grande, between Fort Worth and Brownwood.

SOUTH AMERICA ROADS.—Confirmation has been made of the proposed amalgamation of the Buenos Ayres & Rosario and Central Argentine railroads. The amalgamated line will be 2,124 miles long, exclusive of the Rio Cuarto extensions now building, so that in length of line operated, the new company will be a close second to the Buenos Ayres Great Southern.

SOUTHERN PACIFIC.—This company's claim to about 3,000,000 acres of land in alternate sections between the Needles and Lancaster, Cal., along the line of the old Atlantic & Pacific R. R., was confirmed by the United States Supreme Court, Jan. 6.

WHEELING & LAKE ERIE.—It is announced that operation of the Zanesville Belt & Terminal by the above company began on Jan. 1.